# The Welding Engineer

**Welding • Cutting • Brazing • Flame-Treating • Metallizing**
*as applied in*
**Design • Engineering • Construction • Production • Maintenance**

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*Associate Editor*

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» «

Eastern Representative:
T. E. DEPEW, 1834 Broadway
New York 23, N. Y.
Tel. Columbus 5-7843

Midwest Representative:
D. R. WATSON, 506 S. Wabash Ave.
Chicago 5, Tel. Harrison 2614

Pacific Representative:
W. R. McINTYRE, 400 East Third St.
Los Angeles 13, Tel. Michigan 8918

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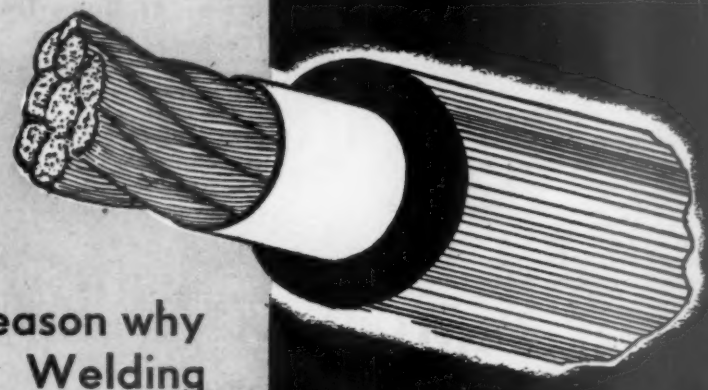

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The Welding Engineer

AMERICA'S PIONEER WELDING JOURNAL

Established 1916

# The Dangers of Peace

Peace is usually pictured as a lovely lady with a dove, a lady who takes flight at the first rumblings of Mars but comes back again with the signing of the treaties to rule over prosperous and contented lands. Nuts! Now that victory looms closer, we must no longer remain blind to the dangers of peace.

The history of our country has always been one of unpreparedness. War invariably catches us with our "plants down" and then follows a peace for which we have been equally unprepared to cope. True, we have hitherto found that it was "darkest just before the dawn," but that's because we are a rich, lucky country. If we persist in stumbling about in the dark, we will either be knocked in the head and thrown in the gutter or fall there of our own accord to bemoan our hard, hard fate.

It's up to us as individuals to do something constructive, remembering always that when the number of individuals becomes sufficiently large a nation is involved. As individuals, we are confronted with two immediate problems: (1) We must win the war and (2) we must prepare to win the peace. And in preparing for peace, our expanded economy makes it imperative that we plan as never before.

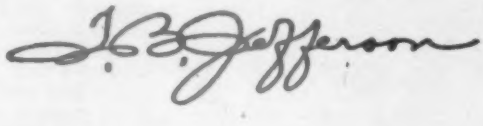
Our economic system has been blown up to double its prewar size because of war production. Generations of industrial advancement have been crowded into a few years. We have increased the nation's capacity to produce goods to previously undreamed of heights. These conditions make it necessary that plans which will permit continued production and employment during the postwar period be started *now*.

The peace of 1918 brought an economic crisis, and many people are expecting an even worse one to occur in 194?. Well laid plans can postpone the arrival of such a crisis in the future. Proper action during the period of postponement —the right follow-through—can definitely prevent its occurrence.

The problem of future prosperity must be one of cooperative effort on the part of business, labor, agriculture, construction and government, including federal, state and local government. The scientific development of machines, methods and procedures has made for unlimited opportunities, but we cannot take full advantage of these opportunities unless we apply the realistic principles of good management to business, to labor and to government.

The welding industry, though dependent to a limited extent on the postwar plans of others, must make postwar plans of its own. Welding equipment manufacturers must plan to keep their enlarged plants with their many employees busy. Perhaps these plants may be engaged in making welding equipment of a more efficient type or even equipment quite foreign to the welding field. The welding jobber will no longer be able to obtain all of the business he wants by merely answering the telephone. He, too, must start planning so as to retain a rightful share of the business he now enjoys.

The responsibility of adequate postwar planning is one of every individual, regardless of whether he is engaged in business or in the conduct of government. It makes good sense to prepare for war in days of peace, particularly so when you have powerful and aggressive neighbors. And it makes just as good sense in wartime to get prepared for peace.

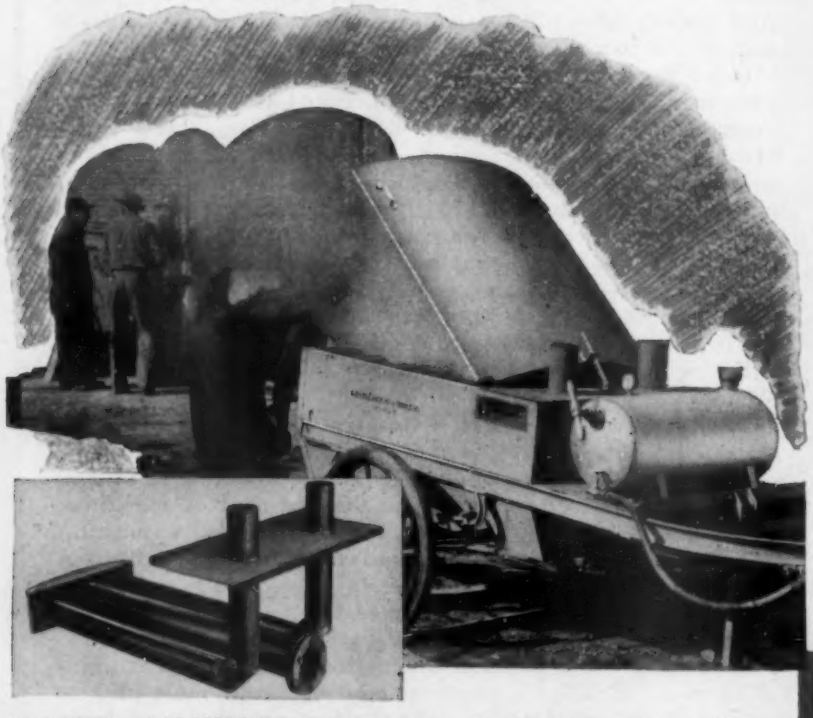


**WE ANNOUNCE** the addition to the Murex line of Type MA—the first true Grade E-7011 electrode. A general purpose rod, which handles easily in all positions, Type MA is designed primarily for A.C., but may also be used with D.C., reverse polarity. It deposits weld metal of high tensile strength and can be used on Carbon-Moly. and other 70,000 P.S.I. steels.

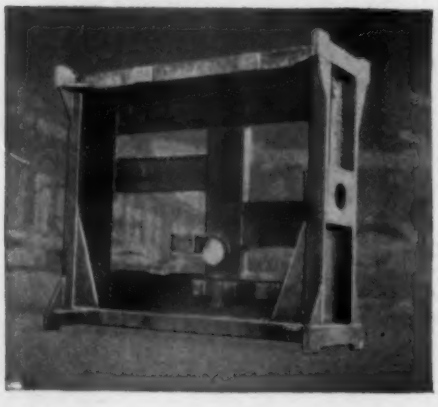
Further information on request.

**OPERATING INCHES** deep in coal dust, these spur gears have been driving the mechanism for conveyor and cleaner cones since 1932. The gears are cut from Murex welded gear blanks, fabricated by Lukenweld, Inc. from rolled steel plate, which is free from blow holes, sand pockets or other internal defects sometimes found in poured blanks.

**ELECTRODE RESEARCH** and development work is carried on at the Metal & Thermit laboratory at Woodbridge, N. J. Raw materials, including the core wire and flux ingredients, are carefully analyzed in order to produce electrodes of certain pre-determined characteristics. Electrodes are tested for their operating and deposition characteristics and the quality of the weld metal.



**IN THE MELTING OF ASPHALT,** temperatures up to 2,000°F. are generated by the heat flue system, which is welded with Murex Electrodes by Littleford Bros., Inc. The melting kettles are also fabricated with Murex and, according to the manufacturer, the welds stand up under the terrific heat "exceedingly well."



**THE MACHINE TOOL INDUSTRY** speeds vital production through the use of arc welding. Other advantages of welded construction are ample rigidity with less weight than obtained with castings, and lower cost. The base illustrated was welded from flame-cut plates by The Dayton Fabricated Steel Co., with Murex Type FHP electrodes—"hot" downhand rods which produce sound, X-ray clean welds of high tensile strength and good appearance.

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# Shadows of the Future

**★ Part One—In a two-part article, the editor of THE WELDING ENGINEER will discuss postwar possibilities of welding. The first installment contains his impressions of basic problems which will confront industry in general and welding in particular in the postwar world.**

**By T. B. JEFFERSON**

COMING EVENTS, it is said, cast their shadows before them. It seems to me that at least some of these shadows can now be recognized and interpreted with more or less accuracy. So I am going to take you on a brief excursion into shadowland to look upon the problems that industry will face in the world of tomorrow as well as the specific problems which welding will face.

The part welding is to play in the postwar world is closely linked to the part industry will play because welding has become an integral part of our largest and most influential industries. Since welding will rise or fall with the prosperity of those industries, it is only natural that the first question we should ask is: What, in general, will the world of tomorrow be like?

### To the Dogs or Not?

Strange thoughts are apt to pass through the mind when mention is made of the postwar world—the world of tomorrow. Some look into a crystal ball and see an entirely different world from the one we have. Others merely stare hopelessly into empty space; for them, the world has already gone to that place where bad worlds go when they are finished. Finally, there is a third group that does not believe we will have a brave new world, nor a basically different world, nor even a world that has gone to the dogs.

The truth is that there is no particular reason why we should not enjoy much the same sort of world we had in the prewar era, if government or industry, or both working together, can succeed in solving three great and urgent problems. These are:

The problem of producing a vastly greater volume of civilian goods in every line of industry.

The reflected problem of meeting the demand for jobs on the part of demobilized soldiers and discharged war workers.

The war-caused need for a broader tax base to carry the heavy fiscal burdens which will otherwise be continuously imposed upon production.

Let me repeat: the major postwar problems of industry directly and welding indirectly will be: production, jobs and taxes.

Naturally, industry will also be faced with hundreds of other problems in the transition period; problems caused by reconversion, obsolescence and depreciation of plants, need for new capital, dangers of inflation, etc. These must be overcome, and we cannot pretend that it will be easy. On the other hand, we will be aided by many new ideas and new inventions developed as a result of the war.

### That Tax Problem

Unless there is a constant investment of new capital, we cannot expect continued adequate employment in the production and distribution of consumption goods and consumers' durable goods after the first hectic rush to meet the pent-up demands is over. And new capital must be derived, in the form of personal or corporate savings, from the profits of agriculture, manufacturing, mining, transportation and other kinds of businesses.

But what happens to new capital when the present high taxes on corporations and on individual incomes appropriate the amounts that would otherwise become available for investment? The problem is not academic; it is real and very serious.

### What Will Labor Do?

The attitude of labor will also be very important. It is to labor's interest that business should have a chance to make a profit, for without profit there will be no advancing wage level, no increased capacity to produce, no increased number of jobs.

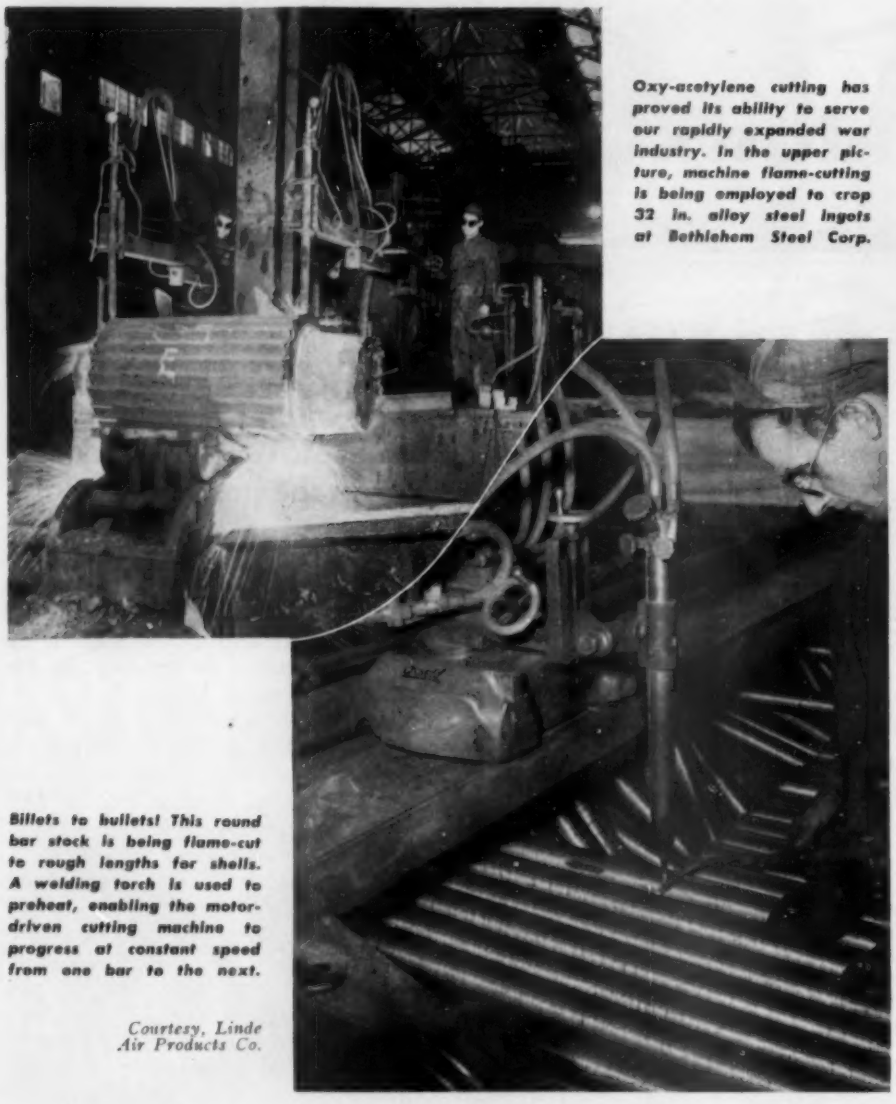
It is to be hoped that labor will learn to welcome the expansion of production by every scientific discovery and every labor-saving device such as automatic welding. Labor-saving equipment does not mean a greater speed up of workers, longer hours or lower wages. Its effects are just the reverse, as can be proved by our whole industrial history. We cannot come through the postwar period satisfactorily unless labor leaders exert their immense power to remove foolishly hampering restrictions on individual effort and the use of new devices.

### Government in Business

New Deal economists advocate huge government spending to provide employment for those that they believe private enterprise will be unable to employ. No student of economics questions the contention that there should be peacetime government expenditures on public works for which there is a public need or desire. Such expeditures, however, should not intrude in a desirable field for private investment, and the fields within which the government can make peacetime investments without going into direct competition with private industry are of necessity very limited.

Organized labor has as much interest as its employers in keeping the government out of business and in preventing the government from dictating to business. Labor must not be blind to the fact that trade unions are shorn of all real freedom when the government becomes their employer and dictator.

Right now our federal government owns more land than there is in the



*Oxy-acetylene cutting has proved its ability to serve our rapidly expanded war industry. In the upper picture, machine flame-cutting is being employed to crop 32 in. alloy steel ingots at Bethlehem Steel Corp.*

*Billets to bullets! This round bar stock is being flame-cut to rough lengths for shells. A welding torch is used to preheat, enabling the motor-driven cutting machine to progress at constant speed from one bar to the next.*

*Courtesy, Linde Air Products Co.*

New England states. In addition, it owns, through the Defense Plant Corp., RFC and other government agencies, practically all of the synthetic rubber industry, 96% of our shipbuilding capacity, 92% of our aircraft plants, 92% of the magnesium industry, 50% of the aluminum capacity, 50% of the machine-tool capacity, 10% of the steel capacity and so on down the list. Obviously, the government is in all industry to some extent. This will have its bearing in the postwar world.

The government can do something to provide employment on public works; the privately owned construction industry, however, can do much more. It is an illusion to think that government public works are a great remedy for unemployment in slack times. As we learned between 1933 and 1939, the volume of useful permanent government works that can be instituted is so small in proportion to the shrinkage in construction generally that it cannot be of too much value. Government works cannot provide more than 15% of the normal employment made available by the construction industry.

### Demobilizing Our Fighters

The demobilization of the 30,000,000 fighters and workers at the end of the war should not present the titanic problem that most people think. Probably 75% of the men in the armed forces know exactly to what firm, to what farm or to what college they will return to start life anew. We shall need to retain two million or more men in the armed forces. War veterans who need jobs should have them and be given, if they want it, vocational training. The injured and war dependents must be provided for by government assistance. A large number of war workers will be absorbed by the conversion back to civilian goods. Many women now in war work will return to their homes or get married and establish homes. Salesmen, professional men, small merchants and others will return to their prewar occupations. A healthy economic and social climate should produce a lot of new jobs; nevertheless, there will always be unemployables.

### Specific Welding Problems

These postwar thoughts may seem to be somewhat remote from welding, but actually they are not. The postwar prosperity of welding will depend in a great measure upon the postwar prosperity of industry.

Let's get down to the subsidiary and specific problems that welding will face tomorrow. In my opinion, the major ones will be:

The time-and-eternity problem of welding vs. riveting.

The problem of the consulting engineer's attitude.

Those suspicions about locked-up stresses.

The question promulgated three decades ago as to whether welding is a tool or a trade.

### Welding vs. Riveting

Experience in welding ships and heavy equipment during the war will undoubtedly lead to a greater proportion of welded to riveted structures, but welding will not be exclusively favored by a steel maker or a fabricator as long as he has punch presses and riveting equipment available.

Emphasis has been given to the use of welding by the wartime necessity of conserving every ton of steel possible. This condition will undoubtedly prevail in the postwar era for competitive reasons. There will also be an ample supply of trained weldors, who will help to contribute to the widespread acceptance of welding.

### The Consulting Engineer

The consulting engineer may present a problem so far as the welding industry is concerned. Regrettably in the past, some consulting engineers, particularly in the structural field, have held back their endorsements on the use of welding. These gentlemen, who were thoroughly familiar with the strength of riveted joints, sometimes refused to take into consideration factors determining the strength of welded joints. Whether it was laziness on their parts, mental inertia or the thought that they were dealing too much with the human factor in a welded joint, they have been reluctant to use welding where it could be used advantageously.

These men must be educated so that they will not impede the economically advantageous use of welding in the postwar world. This is a job for the American Welding Society. Its leaders must sell such individuals, and government regulatory bodies as well, on the authenticity of AWS codes and specifications.

### Those Locked-up Stresses

Unfortunately, many of the problems connected with locked-up stresses have not as yet been solved. The activities of the Truman Committee in its investigations of the failures of various Liberty ships and tankers will undoubtedly do much to build up doubt in the minds of many people. But the readers of the Truman reports alone will fail to take into consideration all of the facts that are presented.* It must be remembered that only a few of the thousands of Liberty ships we have built have failed at sea—also that even the ships which have failed have been rewelded and put back into service.

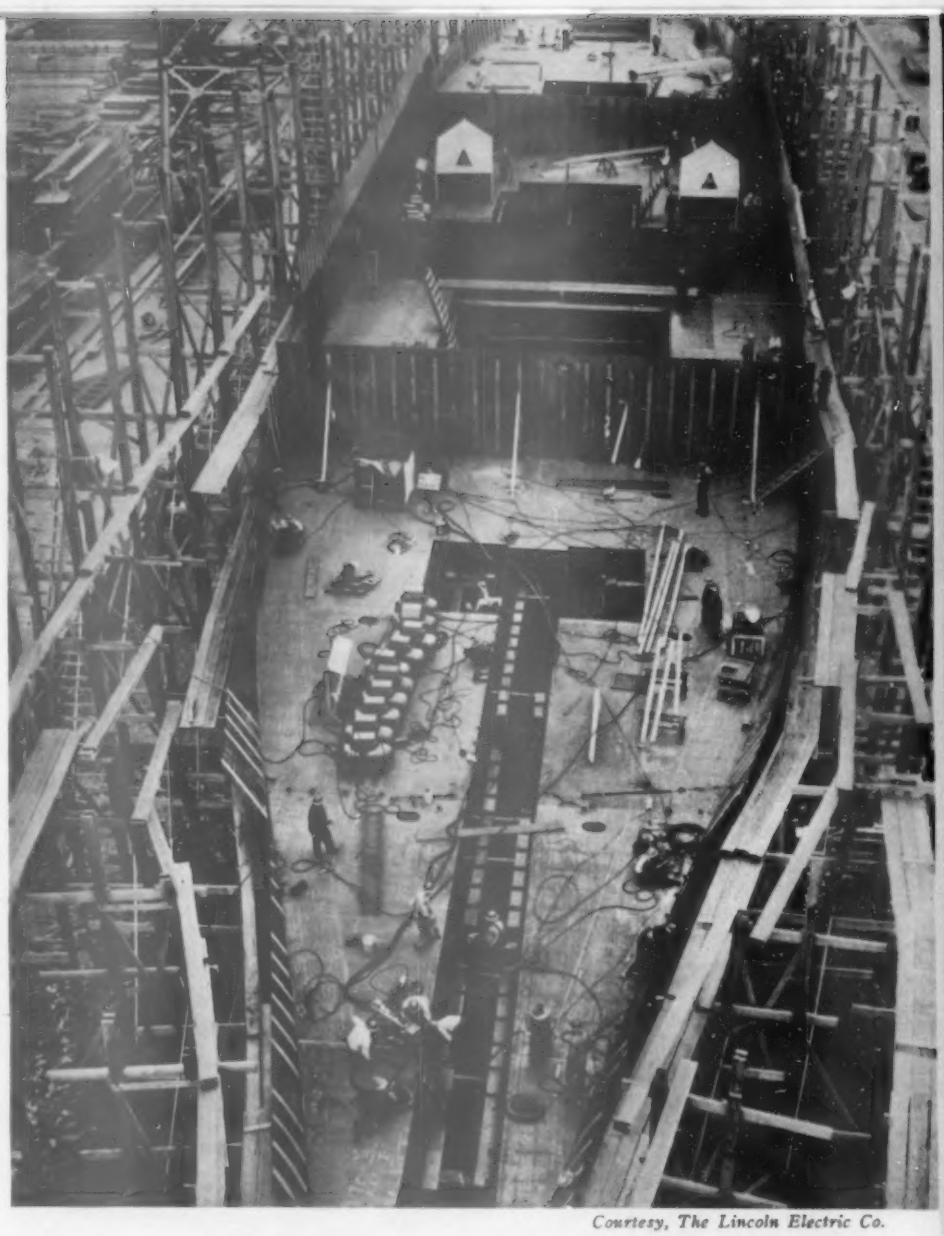
Those failures which have been experienced have invariably occurred early in the careers of the ships concerned. I do believe that many of the cracks could have been avoided if we had not been in such a hurry to get the ships launched. After a welded ship has been in the sea for a month or two, it can usually take a torpedo or two into its hull and still get home.

Nevertheless, people will remember the failures, and further efforts must be made to solve the perplexing basic problems of residual stresses in large welded structures. From the practical standpoint, welding sequences that will minimize shrinkage stresses as much as possible must be planned. In this connection, it should be noted that the most serious causes of locked-up stresses occur when the final closing welds are made in big assemblies that are not free to move.

### Tool or Trade?

Another problem which will confront welding in the postwar world is that of whether welding is a tool or a trade. The American Welding Society has been reluctant to assume leadership in the solution of this question, probably rightfully so since it is an engineering body, but this irritating problem must be solved. In the early days of the war it led to work stoppages in some of our west coast shipyards, which resulted in considerable unfavorable publicity for welding.

The tool-or-trade question will become even more serious with the curtailment of employment after the war. It must be settled once and for all if we are to expect a peaceful program in the use of welding in the postwar era, for we cannot expect a contractor to build a welded structure if he must have an iron worker sitting in the shade for every weldor on the job. This very condition has prevailed in certain localities in the past and, most certainly, its existence is one of the reasons why we have not had more welded structural steel buildings. The problem will continue to harass our future unless a satisfactory agreement can be reached.



*Courtesy, The Lincoln Electric Co.*

***Such scenes as this one at Seattle-Tacoma Shipbuilding Corp. conclusively demonstrate the important role played by arc welding in the construction of our vast wartime fleet. When the war ends, will these and the many thousands of other arc welders sold to shipyards and arsenals be dumped on the market at ruinously low prices?***

### Plastic Adhesives

A new postwar competitor of welding will be plastic adhesives, for which extravagant claims are being made. It is being said that these products will do the work of nails, screws, welding, riveting and binding. At least four large organizations have perfected materials to "take the place of riveting and spot welding." A typical example is a plastic adhesive, applied through the use of heat and pressure to bind metal to metal, which is said to be capable of making a stronger joint than the metal itself. Variations of the formula produce a similar bond between metal and wood, plastics or other materials. One of these adhesives is said to be capable of "soldering" glass to glass or glass to metal. Still another is used for coating plywood with corrosion-proof metals for automobile bodies, kitchen equipment, and for walls and panels in buildings.

Most of these claims about the replacement of welding can be taken with a grain or two of salt. Plastic adhesives will undoubtedly have their uses in the postwar era, but it is absurd to suppose that any such bond will have anything like the tensile and shear strength of a welded joint. The applications of these materials will of necessity be very limited, and I believe that they will compete little, if any, with welding.

The peacetime potentialities of gas, arc and resistance welding will continue along the line of the expanded activities which came about as a re-

* See page 33, THE WELDING ENGINEER, April, 1944.

*This automatic equipment was designed to permit the study of the variables involved in magnesium arc welding. Research looking toward the more widespread use of inert-gas-shielded equipment is now being carried on, and there will undoubtedly be interesting new developments in this field.*

sult of the war. Naturally, production will be curtailed somewhat since the industry's growth during the war has been far beyond the normal trend, probably five to seven years beyond. In view of this, there undoubtedly will be some dip in the welding industry's upward trend.

### Gas Processes

Welding and oxy-acetylene cutting have proved their ability to serve the rapidly expanding war industries. Flame-cutting and welded fabrication are used not only to supplement other methods of joining materials but are finding widespread acceptance on the bases of economy, utility, material availability and flexibility of design. They will provide even better answers to metal-joining problems in the future.

All of the flame-treating processes will be expanded into heretofore unforeseen fields. Newer processes like flame-machining—the process of tangentially removing unwanted metals by oxidation—will come into widespread use. Flame-machining makes it possible to remove materials at speeds which cannot be approached by any of the older mechanical operations such as turning and milling. Procedures are now being developed whereby tolerances of ⅛ inch may be adhered to in rough machining operations with the oxy-acetylene torch.

### New Arc-Welding Equipment

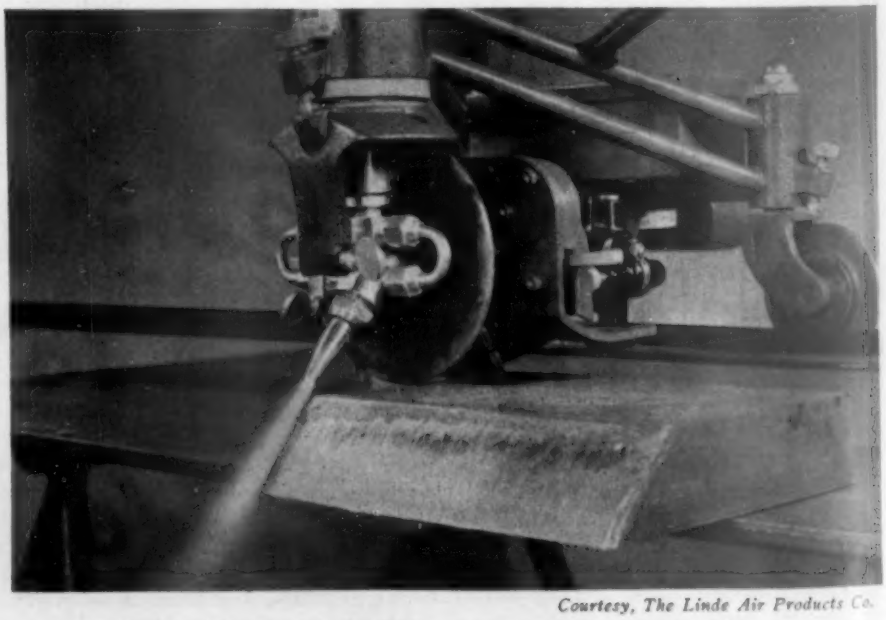
We must look for developments which will lead to the obsolescence of much of our present day arc-welding equipment. These developments will be brought about for several reasons but chiefly for the purpose of establishing a postwar market for arc-welding equipment. Of the thousands of arc welders sold in the past three years, many have gone into shipbuilding and other industries which will not require as many welding machines in the future. "Where," manufacturers of welding equipment have been asking themselves, "are these welders going after the shipyards and arsenals get through with them?" To the junkyard is the correct answer for a large part of this equipment.

A large amount of shipyard welding equipment has been shamefully overworked. Machines which were not designed for 24-hour-a-day service have been used on such continuous applications month after month. As a result of overwork and little maintenance, this equipment is not much good for further use. But it is the desire of manufacturers that even equipment which has been maintained and treated properly should also be replaced. This can only be done by convincing the owners that they are losing money by continuing to use their wartime welding equipment. So we may look for the development of new arc welders and new electrodes that will produce more satisfactory results than those of the present day. These replacements will probably evince a trend toward the more widespread use of a-c welding.

Undoubtedly, there will be further developments in the field of inert-gas-shielded arc welding, opening many possible welding applications. Research looking toward more satisfactory and widespread uses of this equipment is being carried on in this field now and undoubtedly will continue in the postwar world.

### New Resistance Welding Uses

Resistance welding is rapidly assuming a much more favorable position. Though ideally suited to many applications, the process has hitherto been handicapped by the lack of understanding of its possibilities. This lack of understanding is not confined to users or potential users but will be found to be also existent among manufacturers. It is not at all unusual to find engineers in the user group who know much more about the possibilities and proper uses of resistance welding equipment than do the engineers who made the equipment. Needless to say, when those who design and sell equipment don't know just what it will do, it is rather difficult for them to educate customers.



*Courtesy, The Linde Air Products Co.*

*Flame-machining makes it possible to remove materials at speeds which cannot be approached by older mechanical methods such as planing or milling.*

Electronics has been tied into resistance welding, making possible the precise control of the high currents that must be handled in modern welding practice. Electronic tubes permit warplane parts to be spot welded at speeds as fast as 1,800 welds a minute. Some of the tubes act as switches, starting a weld in two-thousandths of a second. Continuous developments in the field of electronics will undoubtedly have marked effects not only upon resistance welding but also upon arc welding and flame-cutting.

### Non-Metallic Welding

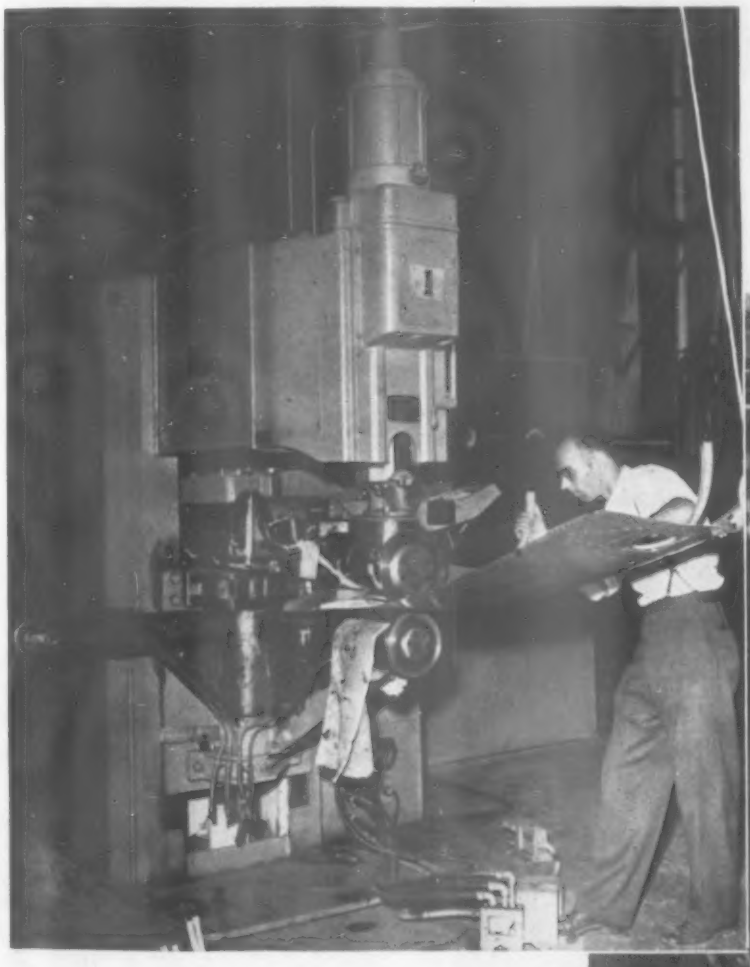
Controlled high frequency heating will undoubtedly be used to a greater extent. In all probability, it will be employed to heat non-metallic and non-conductive materials to the plastic state for pressure welding applications. As these various materials are being so joined, the question will arise: "What is welding?" When heat and pressure are applied to steel, as in resistance butt welding, you are welding, but when heat and pressure are applied to rubber, you are not welding but vulcanizing. In the future, will you weld or vulcanize plastics, glass, etc.?

### "Cyclotron" Welding

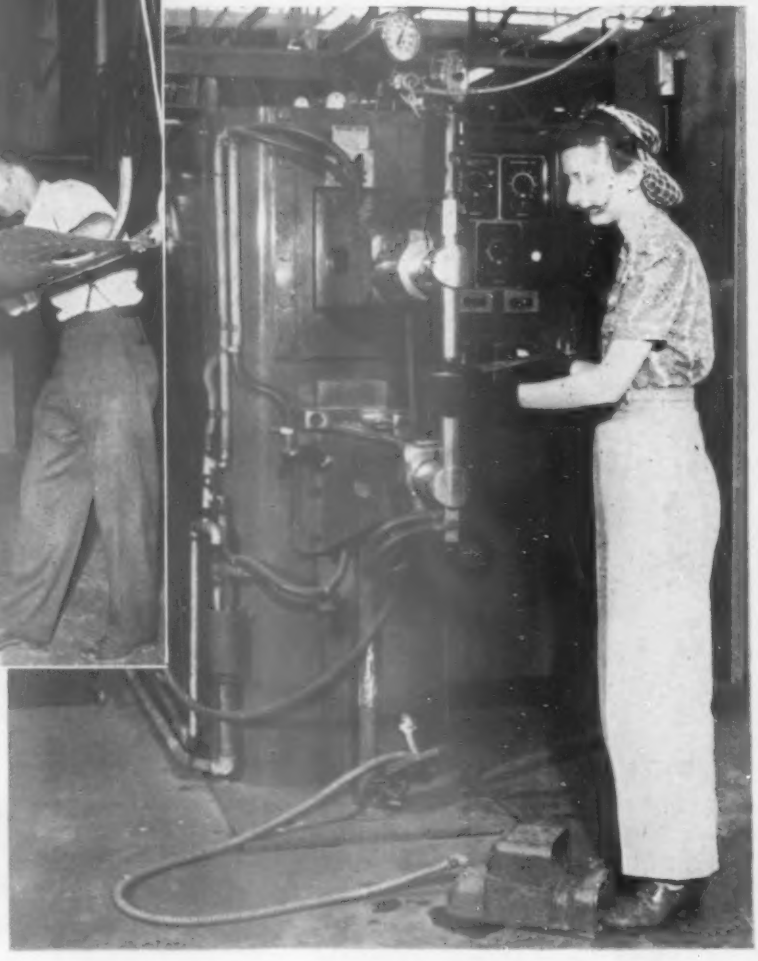
There is always a likelihood of warpage and distortion in welding applications where considerable heat is introduced. By delving into the realms of possible welding applications, this problem could be overcome, at least theoretically, by the adaptation of atom-smashing devices to welding applications. In this type of "cyclotron" welding, heat would be introduced only to the last layer of molecules as the atoms are split. This continued action will finally invoke the forces of cohesion without material change of temperature.

The invention of cyclotron welding offers many potentialities. By breaking up this last layer of molecules, it will be possible to join (by lap or butt joints and without adding filler material) dissimilar metals, to weld metals to wood or even to weld wood to itself. Such projects have probably not as yet reached even the laboratory stage. They may seem far fetched, but I do not believe they are entirely outside the realm of possibilities that are offered by atom-smashing research.

*Part Two, to follow in the July issue, will include Mr. Jefferson's thoughts on postwar materials and their effects and the important question of postwar welding uses.*



***Resistance welding is rapidly assuming a more favorable position in industry as the result of its major contributions to the war effort. The upper picture shows the seam welding of aluminum fuselage sections for fighter planes built at Curtiss-Wright Corporation.***



***Electronics has been permanently joined to resistance welding to make possible the precise control of the high currents that must be handled in the welding of aluminum. This young woman employee of Curtiss-Wright is spot welding a small plane part.***

# Flame-Priming for Paint Wear

*By* **CLYDE B. CLASON**

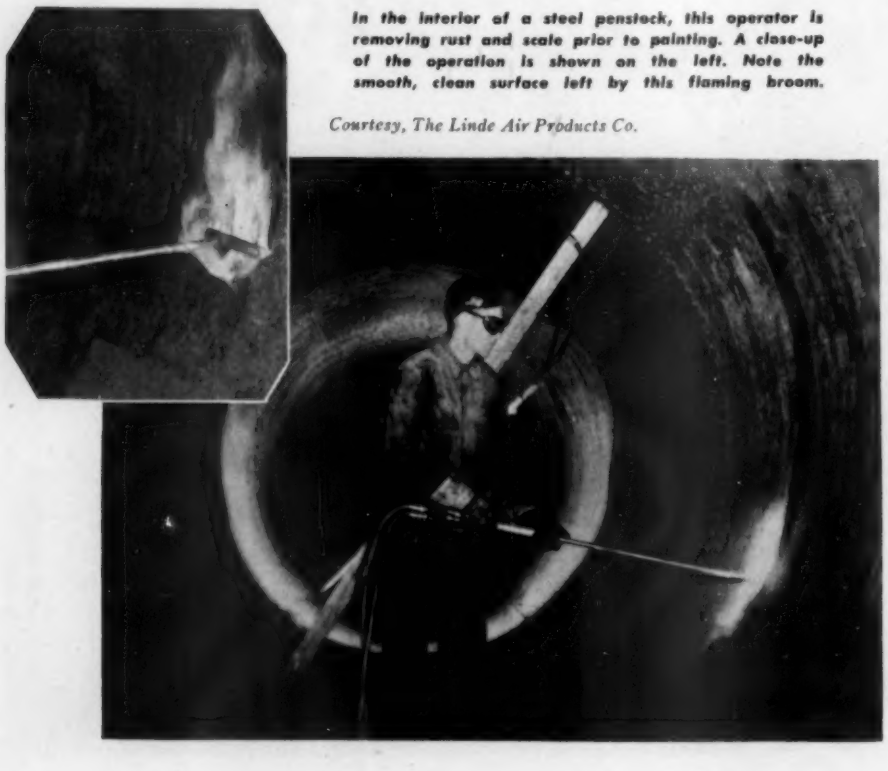
***Flame-priming a railroad bridge prior to repainting. The operator is using a 4 in. flat tip. Note the loss of paint caused by the flaking of the underlying mill scale.***

*Courtesy, Air Reduction Sales Co.*

**Many maintenance man-hours can be saved if the paint job is done right the first time. Flame-priming lifts off all loosely bonded scale, dehydrates rust, provides a hot, dry surface for application of the paint coat.**

SURFACE preparation is the most important part of steel painting. Weathering tests conducted by a large steel fabricator and reported by the American Institute of Steel Construction show that comparatively cheap iron oxide paints on well-prepared surfaces will stand up longer than expensive red lead paints laid on poor surfaces. It is easy to see why this is true.

When the surface has not been properly prepared, mill scale will loosen and flake as a result of weathering and in doing so will take the paint with it. The underlying steel is then exposed to atmospheric oxidation. The effect is progressively disintegrative: the more steel exposed, the greater becomes the opportunity for moisture to find its way between the remaining scale and steel, thus causing fresh flaking and loss of paint.



***In the interior of a steel penstock, this operator is removing rust and scale prior to painting. A close-up of the operation is shown on the left. Note the smooth, clean surface left by this flaming broom.***

*Courtesy, The Linde Air Products Co.*

### Expensive Maintenance

Early ineffectual methods of surface cleaning (or no cleaning at all) have necessitated heavy expenditures for the maintenance of such structures as bridges. Note the loss of paint in the railroad bridge pictured at the beginning of this article. Spot painting of the bare areas will accomplish only a temporary relief, for it does not affect the underlying cause; the scale will continue to lift and the new paint will shortly go the way of the old. The only satisfactory method of renovation is to: (1) chip or scrape off the old paint, (2) remove the loose mill scale and dehydrate the scale not loose, (3) repaint. Only if this procedure is carried out will the repainting be permanent.

The quickest, easiest to apply and most generally satisfactory method of surface preparation for painting is the method known as flame-priming. This is a process of cleaning steel surfaces with an oxy-acetylene torch

*Courtesy, Air Reduction Sales Co.*

**This operator is using a round tip to clean heavy scale from the angles and rivets of a railroad bridge.**

head having a series of closely spaced, high-temperature and high-velocity flames. As the flames progress along the surface, the sudden thermal expansion causes a certain amount of the mill scale to lift or crack off. The cleaning is accomplished immediately before painting so that the surface is still hot when the first paint coat is applied.

### Flame-Descaling, Flame-Cleaning

Some confusion exists between the terms flame-priming, flame-cleaning and flame-descaling. Though similar oxy-acetylene equipment and technique are used for these three processes, the terms must not be considered as synonymous.

Flame-descaling is a process used in steel mills, rolling mills and foundries to remove oxide encrustations from billets, slabs, rounds, bar stock, blooms and ingots. The scale is rapidly heated, and the resulting differential expansion causes it to crack and fly off in small particles, leaving a natural or "clean" surface and exposing such defects as seams and fissures.

Flame-cleaning is a process for cleaning steel surfaces by means of oxy-acetylene flames. It differs from flame-priming only in that the surfaces so cleaned are either not painted or are painted afterwards when they have cooled to atmospheric temperature.

To avoid confusion, the terms flame-cleaning, flame-descaling and dehydrating should be used for operations where painting is not an integral part of the task to be accomplished. Flame-priming, which connotes an effect upon the paint coat, should be reserved to cover the preparation of metallic surfaces for painting.

### Flame-Priming Equipment

Basically, there are two kinds of flame-priming heads—round and flat. The round tip provides a double circular group of neutral clear-cone flames. It is used for such applications as rivet heads (which carry heavy scale), fittings, faying surfaces, corners, projections and recesses.

A broad, flat multiflame tip is used for large and evenly surfaced areas. This tip has a row of small brush-like flames in close formation and is protected from wear by hard-faced pads and skids, which serve the additional purpose of automatically keeping the flames at the correct distance from the work. The head is attached to a standard welding torch, either directly or by an extension arm.

Tips of this nature are available in widths ranging from 1 up to 12 in. A 6 in. head, the most popular size, has 49 flame ports spaced ⅛ in. apart. Though the orifices are extremely small—approximately 0.020 in. in diameter—they produce high-velocity flames that are over ¼ in. long. A head of this size uses about 13 cu ft each of oxygen and acetylene for every 100 sq ft of surface treated when it is operated at a speed of around 35 ft per min.

### Methods of Use

The round tip is held in a vertical or near-vertical position about 2 in. from the work and swung sideways right and left for a spread of about 12 in. while moving progressively forward. Very tenacious scale may be loosened by holding the tip closer to the work or against it at an angle of about 45 deg. A hard-faced wearing ring is provided on the tip for the latter purpose.

The flat tip is held so that the flames will impinge upon the surface at an angle of approximately 45 deg and is moved forward at a speed of 15 to 50 ft per min, depending on the plate thickness, amount of scale, surface moisture and other conditions. A fairly conservative speed is about 35 ft per min. The scale is loosened by thermal expansion and flies off in a shower of small flakes and minute particles, which rapidly fall downward. The process is helped along by the conversion of the occluded (absorbed) moisture to steam, causing explosive pressure which tends to blow off the scale.

Partially loosened scale is removed by means of a hand or power-driven rotary brush, applied immediately behind the flames. Scale that remains after wire brushing is considered as definitely "tight" and need not be removed by further treatment provided that all moisture has been driven from it. Such dehydration is accomplished automatically by flame-priming, which imparts sufficient heat to the steel to raise its surface temperature well above the vaporization point of water. (212 F).

### Don't Burn Paint

Old paint should not be burned off by the flame-priming apparatus

*Courtesy, Air Reduction Sales Co.*

**This flat flame-priming tip is being used in a structural shop to lift scale on an I-beam.**

(though this can be quickly accomplished) because of the danger of lead poisoning. A majority of paints are lead-based and will produce toxic lead oxide fumes when burned[1]. For this reason, old paint should be scraped or chipped off, even though it is a slower and more laborious process. If, to save time, it should be deemed necessary to burn off old paint, the operator should always be equipped with a respirator that will safeguard him from the dangerous lead fumes.

*Courtesy, The Linde Air Products Co.*

***Flame-priming before painting greatly improves the corrosion resistance of storage tanks and pressure vessels. Here the work is being done in the shop after the completion of welding.***

Oil and grease should also be cleaned off prior to the application of the flames—either by benzine, gasoline or a proprietary degreaser. Other surface impurities such as rust are removed by the flames.

### A Dry, Warm Surface

The advantages of flame-priming are thorough dehydration (all moisture is driven off), a heated surface for the application of paint, simple application, little dust to create a health hazard and the production of a smooth, natural surface. To these must be added the portability of oxy-acetylene equipment, which makes the process available for field surface as well as in the shop.

Of these advantages, the most important is the providing of a warm, clean, dry surface for painting. As little as a single molecular layer of moisture, it has been shown[2], will prevent a satisfactory bonding of the base coat and set up a "headquarters" for subsequent corrosion to manifest itself between the paint and steel. A warm, dry surface causes the paint to flow more readily and to wet the entire surface. Setting time for the paint is also reduced, and painting can be done under damp or otherwise unsatisfactory weather conditions. Finally, the corrosion resistance of paint is increased when it is applied on a warm, dry surface.

For best results, therefore, flame-priming and painting should be done as one continuous operation. At least three men are necessary: an operator to wield the flame-priming apparatus, a helper with the wire brush and the painter, who coats the surface just as soon as it has been cleaned by the other two.

Flame-priming technique is not difficult. The operator quickly learns to regulate his speed to the proper travel by observing the amount of scale that is being loosened in the form of a visible shower of particles. The slower he goes, he will find, the more scale will be removed until he has reached the point of maximum removal. True, the surface may be slightly fused if he moves too slowly, but this is not apt to occur to an injurious extent.

So simple is it to acquire the proper technique that painters who had never seen an oxy-acetylene torch before have been taught to do a satisfactory flame-priming job in a period of only five minutes.

### Little Distortion

Distortion from flame-priming is negligible because the flames are passed over the surface at such a high rate of speed that very little heat accrues in the base metal. The distortional effect of flame-priming, it has been shown,[3] is less than that produced by radiant heat from the sun.

*Courtesy, The Linde Air Products Co.*

***The flame-priming operator and his helper work on one scaffold on this large tank and are followed closely by the two painters on another scaffold. Because of the portability of oxy-acetylene equipment, flame-priming readily lends itself to such applications in the field.***

As a final advantage, it should be stated that flame-priming removes loose scale and dehydrates rust without removal of the "tight" scale that provides additional protection against corrosion. Scale not loosened by the stringent differential expansion between the entire scale layer and the base metal is definitely tight enough to resist any subsequent flaking. This fact has been proved.[4]

### Dehydrating Rust

The reddish-brown rust ordinarily encountered on ferrous surfaces is a

1 Joseph Schuman Wright, "Injurious Welding Fumes," THE WELDING ENGINEER, February, 1944, page 49.

2 A. E. Schuh, "Adherence of Organic Coatings," *ASTM Proceedings*, Vol. 38, 1938, page 484.

3 E. W. Deck, "Flame-Priming Method of Preparing Steel Surfaces," *The Iron Age*, October 29, 1942, page 45.

4 American Institute of Steel Construction. "The Preparation of Structural Steel Surfaces for Painting."

*Courtesy, The Linde Air Products Co.*

***Flame-priming is one of the newest and most effective weapons to be used by the shipbuilder in the battle against sweating and salt-water corrosion.***

hydrated iron oxide. Flame-priming drives off the physically adsorbed[5] and chemically combined water, converting the hydrated rust to stable ferroso-ferric oxide or black magnetite.

The latter oxide appears as a black powder, indicating that all moisture has been driven away. Deoxidation may be continued by further heating if desired until the surface particles are reduced to sponge iron, which shows up as silvery streaks between the magnetite particles. Such additional deoxidation is not necessary, however, as the granulated magnetite is easy to brush from the surface. It does not even need to be removed if painted "hot" because it will readily blend into and become an integral portion of the pigment. If allowed to cool, however, the magnetite powder is apt to reabsorb moisture and other impurities.

### Acid Salts

In addition to rust, surfaces exposed to the corrosive effect of acid atmospheres usually acquire a film of hygroscopic (moisture-retaining) acid salts. These salts cling tenaciously to the surface and cannot be removed by simple wire brushing. Flame-priming drives off the moisture, converting the hygroscopic salts into anhydrous, granulated salts which are easily brushed away.

[5] A distinction must be drawn between absorbed and adsorbed. Adsorption differs from absorption or occlusion in that it (adsorption) refers to the surface adhesion of an extremely thin layer of molecules of gas, liquid or other dissolved substance.

### Applications

Flame-priming was first employed on a broad scale to prepare steel bridges for protective painting. From this application, its use has spread to structural steelwork of all kinds, storage tanks, boilers, penstocks, oil and gas pipe lines, locomotive frames and running gear, railroad cars, railway signal towers, mine tracks and cars, road-building machinery, ship hulls and deck plates, airplane hangar-doors, combat tank hulls, etc. It is used both on new structures and as an aid for the renovation of old ones.

One of the severest tests of the value of the process was provided by the construction of the Chicago subway system. Here the structures had to be painted in the damp compressed air atmosphere of the big tube—they could not be painted separately prior to erection because the paint would have been marred in handling the members. By driving out the surface moisture, flame-priming made it possible to secure a satisfactory paint job on structural members that had been previously dripping with wet rust.

The corrosion resistance of storage tanks and pressure vessels is greatly improved by flame-priming before painting. This may be done in the field, if desirable, because of the portability of the oxy-acetylene equipment.

From the days of the old clipper and earlier, protective painting has always been indispensable to the preservation of ships. Flame-priming has now provided a new and powerful weapon in the battle against the forces of salt-water corrosion. This fact is recognized by the U. S. Navy Bureau of Ships in its issuance of detailed specifications for the flame-priming of steel for ship hulls.

In these days of manpower shortages, it is good policy to save all the maintenance man-hours possible by doing the job right the first time. Flame-priming prior to painting *is* the right way to halt the deterioration of steel structures.

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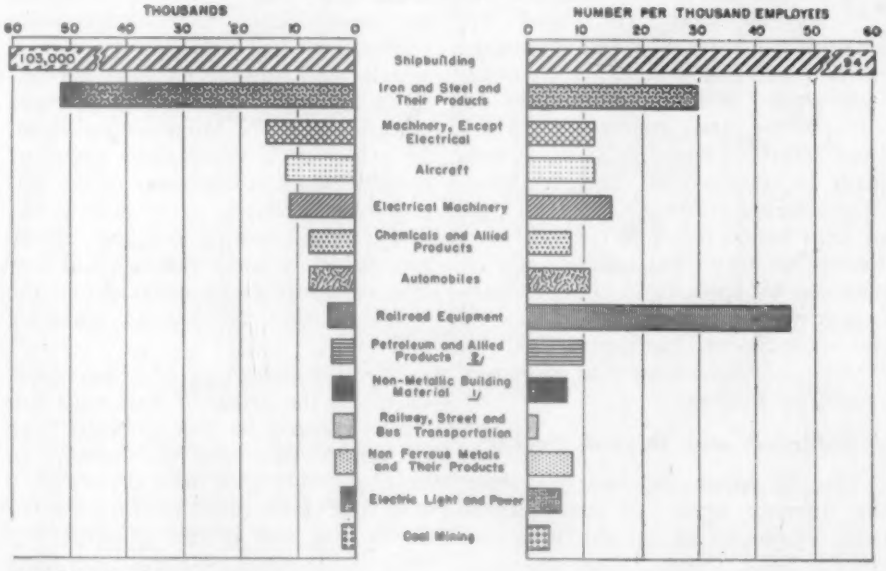
## Welding Shields and Helmets Purchased in 1943 by Major Industries




SOURCE: WPB 2537

1/ Except lumber. Includes stone, clay and glass products.

2/ Includes coke and by-products of coal.

*Courtesy WPB Safety & Technical Equipment Div.*

★ PRODUCTION

# Brazing Armature Coils

*By* C. LYNN

**Manager, D-C Generator Engineering Dept. Westinghouse Electric & Manufacturing Co.**

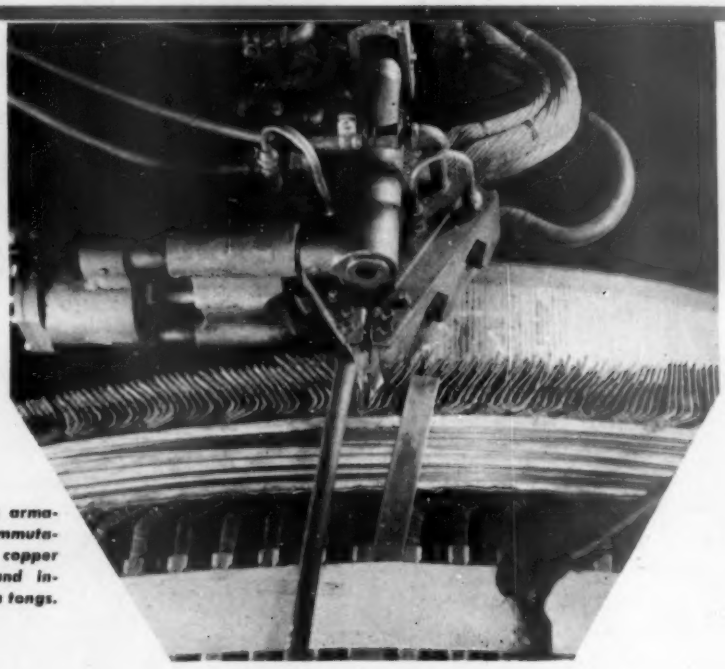


*Fig. 6 — Brazing armature coils to commutator necks using copper alloy material and incandescent carbon tongs.*

**Ever since the development of d-c generators, solder has been used to join armature coils to commutator necks. War made it necessary to find another method.**

SOLDER of the 50-50 variety or pure tin has always been universally used for making the connections between armature coils and commutator necks and between armature cross connections and armature coils on d-c motors and generators. After Pearl Harbor, however, a drive was made to conserve tin, and Westinghouse started to develop a brazed type of joint for these connections. It was found that very good results could be obtained by applying a phosphorous-copper alloy by means of tongs; *i. e.*, the incandescent carbon method of brazing, a process somewhat similar to resistance welding.

### Soldered and Brazed Necks

The accompanying sketches show the various types of commutator necks employed on our electrical machines. Figs. 1 and 2 show standard types of construction used on soldered joints; Fig. 1 (standard double thickness open neck) is the most commonly used. The single thickness open neck shown in Fig. 2 is used when the commutator bar pitch is very thin, in which case an additional piece is riveted on to form an opening at the outer periphery for the armature coil ends. In soldering both of these types of open necks, it is necessary to use filler pieces of copper of the same thickness as the armature coil ends; these are placed between the top and bottom armature conductors and in the opening below the bottom armature coil end.

Fig. 3 shows a type of brazed joint in which the armature coil ends are simply brazed to the standard type of double thickness open neck. In brazing this type of joint, copper alloy strips 0.015 in. thick are inserted between each side of the armature coil ends and the neck. Heat and pressure are then applied by means of the carbon-tipped brazing tongs. The current is stopped after the copper alloy has melted (at 1,499 F) and has flowed over the surface to be brazed, but the pressure is maintained till the joint cools.

### Joints Air-Cooled

In normal production, a blast of compressed air is applied directly to the joint whenever current is not flowing in order to rapidly cool the brazed joint. An improvement consists of blowing a small stream of air in a radially-inward direction against and between the armature conductors just back of the commutator necks. This keeps the conductor cool and eliminates damage to insulation.

Fig. 4 and Fig. 5 illustrate similar types of brazed joints. In Fig. 4, a modified double thickness neck, two pieces of copper are brazed together to form the neck; this method is used where the neck material has already been made or where it has been partially formed in the shape shown in Fig. 1 and later re-formed to that of Fig. 4.

In Fig. 5, the standard single thickness neck is made of one piece of cop-

per, of thickness equal to the total thickness of the soldered type neck shown in Figs. 1 and 2. In this construction, small copper rivets are inserted in the neck to locate in proper radial position the ends of the armature coils for brazing. It is possible, however, to omit these rivets and use a straight edge to locate the position of the armature coil ends radially by reference to the outer periphery of the armature iron. Small pieces of copper alloy (approx. 0.015 in. thick and about half the area of the overlapping of an armature coil end on the neck) are spot welded to the neck to prelocate the brazing material and provide the exact amount of material necessary. Too little or too much copper brazing material, it should be noted, will result in an inferior joint.

### Brazing Advantages

After the necks have been prepared as described, they are brazed into a slot machined in the bar. Formerly, the necks had to be held in position in the slot by soldering and riveting them with countersunk rivets. Both of these steps were eliminated with the adoption of brazing.

Incandescent carbon brazing is well suited to the multiple joints encountered on commutator necks and armature coil ends because it does not require a bright surface for the work. Flux (which may cause damage to adjacent insulation, corrosion of the metal and/or peeling of varnish and paint) is not needed. At room temperatures, the brazed joint is approximately four times as strong as a perfectly formed soldered joint made with pure tin, and it becomes many times stronger than a tinned or soldered joint as the temperature rises. Then, too, the brazed joint can be taken apart whenever desired; this is done simply by applying heat through use of the tongs and then separating the pieces while they are hot.

### Armature Coils

It is absolutely necessary to pretin the ends of armature coils before making a soldered joint. It is also necessary to pretin the open ends of the commutator necks before soldering the armature coils to the necks. The pretinning of the coil ends is done after the coils have been formed but before they are treated in varnish. After the latter treatment, the varnish is removed from the ends by dipping them into a pot of melted tin or solder. If soldering is done with pure tin, the pretinning must be done with pure tin also in order not to contaminate the final pure-tin joint with lead.

When brazing is used, no tinning of any kind is necessary on the open end of the commutator necks. The armature coils, however, must be pretinned and retinned in exactly the same manner when the coils are to be brazed as when they are to be soldered, except that pure tin need not be used. Experiments to eliminate pretinning and retinning of the coil ends by substituting sandblasting, acid treatment, etc. have not yet uncovered any method that compares in ease and cheapness to the removal of the varnish by tinning.

Copper alloy brazing material is ideal for armature coils since it will braze even with the coils tinned or covered with a thin amount of solder. This material also permits the brazing of armature coil ends and commutator neck joints which have previously been soldered. The procedure is to: (1) split the joints, (2) heat the material, (3) remove (with a rag or other means) the bulk of the solder from the copper, (4) place pieces of thin copper strips (in the manner mentioned under the brazing of Fig. 3) and (5) braze the joint with the carbon tongs.

### Cutting down Brazing Time

Westinghouse is continuing experiments and development work on brazing technique in order to improve brazed joints and to cut down the time required to make them. It is hoped that it will be eventually possible to make brazed joints as quickly as soldered joints. We have tried various ways of applying the copper other than by spot welding thin strips to the necks. One method was to spray on a copper plating. In this case, the surface of the neck had to be sandblasted (or roughened in an equivalent man-

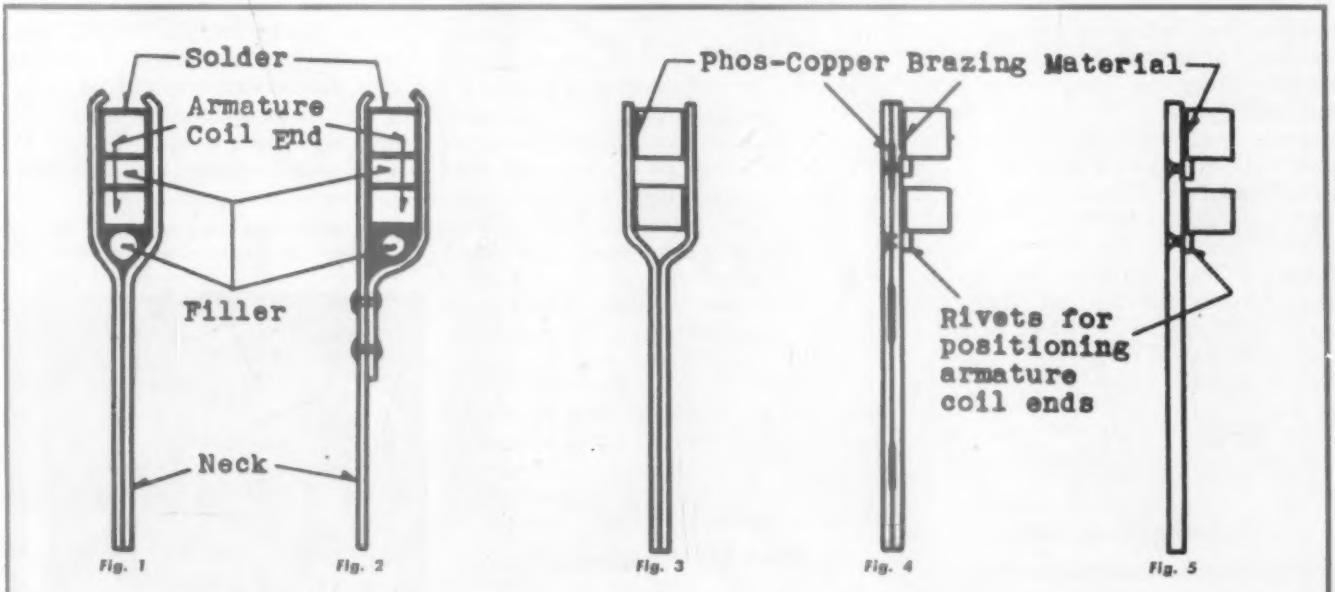



*Fig. 1—Standard double thickness open neck with soldered joint.*
*Fig. 2—Standard single thickness open neck with soldered joint.*
*Fig. 3—Standard double thickness open neck with brazed joint.*
*Fig. 4—Modified double thickness neck with brazed joint.*
*Fig. 5—Standard single thickness neck with brazed joint.*

*Fig. 7—Equipment used for shop brazing operations.*

ner) in order to get the sprayed copper to stick to the neck.

Brazing stands are used for work on the commutator necks in Westinghouse shops. These stands consist of roller-bearing supports, adjustable in height and spacing. The rotor is supported by means of the shaft. Such a positioning fixture permits easy turning of the rotor to bring different joints successively to the brazing head.

### The Brazing Head

The air-operated tongs have parallel moving jaws which can move either inwardly or outwardly in a radial direction along the commutator neck and can also move in an axial direction to permit insertion of the carbon tips. The tips which grip the joints to be brazed are thin and tapered, and each tip is connected through suitable flexible leads to the brazing transformer. These carbon tips can be shaped to any size required, depending upon the space available between necks, the size of necks, coil ends, etc. Approximately 125 to 250 joints can be brazed with one set of carbon tips. Since the tips are small and inexpensive, the cost of their replacement is low.

### Brazing Procedure

The equipment and method used to braze armature coils to commutator necks is pictured in Figs. 6 and 7. It is necessary to bend adjacent necks slightly away from the neck being brazed, and some difficulty in doing this may be experienced on extremely short necks. The neck being brazed lies in a horizontal plane. A lever positions the carbons above and below the joint, and the tips are then pressed together by means of a foot lever, which admits air to a hydraulic cylinder. Further travel of the foot lever applies the current.

A continuous small stream of compressed air blows from a fixed orifice adjusted to the correct location for the particular armature. It blows against the armature coil just back of the neck, keeping it cool and eliminating damage to insulation. When the prelocated copper (previously spot welded to the neck) melts and flows over the joint, the operator releases a switch and stops the current flow. However, he still maintains pressure. The interruption of the circuit causes an additional air blast to blow through a hose and small orifice near the tip of the jaws, cooling the joint quite rapidly. The copper hardens within a very few seconds, and the jaws can then be released.

To break one of these joints, the process is reversed. The joint is heated with the tongs until the brazing material starts to flow. The current and pressure are then released, and the two pieces are knocked apart. It is possible to make and remake a joint three or four times without adding new brazing material.

### Portable Equipment

For use in the field or in manufacturing and repair shops, the elaborate equipment pictured in Figs. 6 and 7 is not needed nor justified. A portable type of brazing transformer with adjustments for varying the value of the brazing current is satisfactory. Such portable equipment, which includes brazing tongs with carbon tips attached to the jaws, is shown in Fig. 8. This portable brazing set also has connections for air supply and suitable magnetic valves which operate automatically in the proper sequence to supply the air to the joints being brazed.

### Cross Connection Joints

On the armatures of d-c machines, there are cross connections between points of equal potential, usually two pole pitches apart. Cross connection joints are ordinarily spaced approximately 2½ in. apart around the armature periphery at the rear of the machine. The standard method of joining them to armature coil clips has been by riveting and soldering. If brazed joints are used, the riveting can be omitted, and the cross connector brazed to the armature clip in the same manner used for commutator necks. In factory production, the brazing material (in the form of thin strips) is attached to the armature coil clips by means of spot welding.

Copper alloy brazing can be applied to many other jobs as well. It can be used on stators of a-c machines, on induction regulators, transformers, etc. It is not always necessary to prelocate the brazing strip material since it can be fed to the work in the form of small rods of about ⅛ in. diameter. Westinghouse has used copper brazed joints for attaching cross connection clips to armature coils on d-c machines for the past fifteen years, and there has never been a failure of the brazed joint. Similarly on the stators of d-c machines, leads from brushholder brackets to brushholder cross connection rings have been copper brazed for fifteen years without any failures.

*Fig. 8—Portable tong outfit for field brazing of armature coils to necks.*

★TRAINING

# Teaching Wilma to Weld

*By* **ROY J. QUINN**

**Director of Public Relations, Shipbuilding and Aircraft Div., Pullman-Standard Co.**

**"Wilma the Weldor" is rapidly becoming the Prima Donna of our war plants. Here's one of the most complete and comprehensive accounts ever published of just what is involved in teaching the lady to become a ship weldor.**

*Mrs. Helen Vargo, 1001 E. Marquette Road, Chicago, whose husband is in the service, wants to enter war work. She chooses Pullman-Standard, Ship Division, and decides to be a weldor. Here we see her being hired by Philip J. Egan of the Pullman-Standard employment department.*

THEY wrote a song about "Rosie the Riveter" in the early days of the war, but industrial progress in America's wartime plants may soon demand a new song if music is to keep abreast of the times. This new song might well be called "Wilma the Weldor."

### Rosie Outmoded

Welding, of course, has been recognized by experts for years as a superior means of construction. Now the Army and Navy endorsements of welding for heavy armament assure it a top place in the postwar world. So poor old Rosie is definitely outmoded, while her younger rival, Wilma, is just beginning to come into her own.

Every industrial change brings a train of other changes dependent upon the first. It has been so to some degree with welding, and by far the most extensive change has been the employment and training of women to become weldors.

Something of the problems to be met by the manufacturer who would make full use of women, in welding or any other industrial process, may be gleaned from a report of the Pullman-Standard Car Manufacturing Co., released through its assistant to the manager of works, Harry Sherman. Pullman-Standard, it should be noted, has been using welding since 1911 in order to reduce the weight and strengthen the construction of railway equipment.

### 25% Women

Today, the company's Shipbuilding Division on Chicago's South Side is utilizing the entire facilities of its 160 acres (where the flashy stream-lined trains were conceived and born) to produce submarine patrol vessels and the new secret landing craft for the Navy. The Navy has specified welding for these ocean-going warships, and the company has accordingly intensified its welding training program to meet the demands.

Previous to the present war, the management had looked upon the car shop as the "holy of holies" for the male employee. But war changes apparently fixed outlooks. Today, Sherman reveals, over 25% of the employees in the shipbuilding division are women, and nearly 80% of the trainees now in the welding school are women.

### Wilma's Training Program

To weld, Wilma must first go to school. Let's take a quick glance at her training program.

The average woman weldor at Pullman-Standard graduates from the training after about 200 hours of instruction. She then has had practical instruction and has passed tests in flat and vertical welding and has had some overhead welding. There is no classroom instruction in welding theory; all theory is taught at the welding stations during actual training. Trainees, however, do not do actual welding on ships.

The training school teaches the following types of welding: stringer bead, stringer pads, flat fillets, multiple-pass flat fillets, flat butts, vertical fillets, vertical butts, overhead pads and fillets and overhead butts.

In the general school, all instruction is in arc welding; however, there are separate schools which teach some gas welding and some silver brazing. Wilma does not do flame-cutting at Pullman-Standard, but she welds plate on every part of the ship. She also does pipe welding, both in the subassembly shops and on the ships.

### Promotion and Pay

As to the chances of promotion, Wilma may become a leader if she is good enough but so far none of her feminine companions have been made foremen.

Wilma must not be allowed to become bored, or she will quickly go stale. Company executives have de-

*After being fingerprinted and photographed by plant protection officers, Mrs. Vargo goes to the medical department for a complete physical examination. Here Dr. R. J. DeMotte, company medical director, is taking her blood pressure.*

voted considerable thought to the problem of making life more interesting for Wilma and her friends. Pullman-Standard has made arrangements with the YMCA in the neighborhood to permit her to use the swimming and gymnasium facilities at certain times during the week. She also has her softball and bowling leagues within the plant.

This covers practically everything but pay. Wilma's ultimate weekly earnings will depend upon her own ability. When she is accepted for employment at Pullman-Standard, she starts at 65c an hour. The hourly rate is constantly increased until, as an expert weldor, she can earn up to $1.20 per hour. It should be noted that she is paid at exactly the same rate as male weldors.

### Washstands and Water Closets

To enable Wilma to become a ship weldor, much advance planning had to be done in order to provide adequate plant facilities and conditions which would meet her needs and keep her a satisfied employee after the first novelty of the job and the patriotic urge had worn off or become subordinate to the grind of the daily tasks.

First the plant engineer went to work. He surveyed each unit in which women would work, taking cognizance of the laws of the federal, state and municipal governments. It was necessary, he found, to provide washstands on the basis of one for every 1 to 15 employees, two for every 16 to 30, three for every 31 to 50, and one for each additional 25 female employees. Water closets had to be provided on the ratio of one to every 1 to 8 employees, two to every 9 to 20 employees, three to every 21 to 40 employees; one for each additional 20 female employees.

Each woman employee of Pullman-Standard is furnished with a steel locker. Showers are available, and tables and benches are provided for those who wish to eat lunch in the locker rooms. These quarters must be (and are) well ventilated and in winter are kept at a 72 F temperature.

Since Wilma will have a rest period on each half-shift, her rest room is compelled by law to be at least 60 square feet. Proportionally 2 square feet must be added for each employee over 10 using the room. Leaving little to the imagination, the laws even state that the room must be furnished with necessary couches, chairs and benches.

To meet all of the above requirements, from six to eight weeks will be needed to prepare your plant for women employees. But a mere foundation of adjusted plant facilities, Sherman asserts, is only a start toward the considerations shown to Wilma at Pullman-Standard.

She will find a medical department with a plant surgeon in charge and first aid stations staffed by trained nurses in the shop; she will receive a pre-induction physical check-up; an eye doctor is there to prescribe for her eyes, and she will receive emergency dental attention. Also, she will be offered the opportunity of participating in group life, accident, health and hospital insurance, retirement income and other benefits.

### Hiring, Orientation, Safety

When Wilma comes seeking employment, she first goes through the employment department for hiring and for the necessary plant-protection recordings. She is then sent over to the welding school as a beginner trainee for a look at working conditions. There will be no attempt to conceal from her the din of the shop noises with which she will be later surrounded. She will meet the women's counselor, and 48 hours later will receive a visit from the counselor at her job.

We have already discussed what she will learn about welding. In addition, she will learn about the ships the company is building for the Navy. Both isometric drawings and photo-

*Indoctrination and training to acquaint prospective "Wilmas" with the plant schedule and the company's products take one full day. Here Instructor Harry Anderson lectures to Mrs. Vargo and other women on espionage and its dangers to a war plant.*

graphs will be used to teach her the details, and the need for these ships will be demonstrated through morale-building sound movies.

Her safety education is not neglected. A resumé of plant rules and regulations is followed by a concise talk by the safety inspector on the importance of safety and safe work. She will be given free, for her personal use, a pair of goggles with a plastic frame. At the plant store, she

*Indoctrination completed, Mrs. Vargo dons welding garb to get training in the welding school. Within her first 48 hours in the school, she is visited by Miss Virginia Trescott (left), women's counselor, who helps women workers in their varying problems of adjustment.*

can purchase such items as safety shoes, standard denim work suits, weldors' gloves, leather coats, leather sleeves, spats and other accessories to accident prevention.

It is a matter of executive opinion at Pullman-Standard that safety is not only humanitarian but economically wise. Wilma is taught to react automatically and subconsciously to safe practices under all conditions.

For more than 30 years the company has fought accident hazards, and Wilma is brought up-to-date on the practical applications of safety practices. Plant papers, posters, morale, activities . . . all combine to keep her conscious of safety.

### More Safety Details

Only recently the company developed a new pressure welding mask (see page 78, THE WELDING ENGINEER, April, 1944) which positively prevents any inhalation of welding fumes that might make Wilma ill. With this mask, she can work in close quarters deep in the hulls of warships where efficient ventilation is difficult.

Last April, Wilma, along with the other thousands of employees in the Shipbuilding Division, witnessed the conferring of a special award plaque from the National Safety Council. On this occasion, Vice-President Wallace N. Barker told her that a report of every serious accident goes over his desk and over the desk of President C. A. Liddle. She also heard Safety Director Paul Brand explain how safety practices at the Shipbuilding Division had made possible an accident frequency rate of 4.24 as compared to an average of 30.9 for 281 other shipyards throughout the nation.

Wilma's adjustment to her new job is helped in a great measure by a kindly matron or housemother, who is in charge of the rest rooms. This motherly soul is selected for ability and willingness to maintain the rest room in good order while carefully chaperoning her charges. She can be of inestimable help in lessening the industrial relations problems arising among women employees. By discreetly selecting such key people, management can greatly lighten its own burdens.

### The Human Element

Even when Wilma is well along in her work, she must not be forgotten, for she and her pals have a faculty of from time to time "getting in each other's hair." If two women under one roof constitute the Chinese symbol for trouble, what about several hundred of them? This is where our women's counselor, trained in the field of industrial relations and with a fund of sound knowledge and experience, can take over. In these very complex personal situations she can, through judgment and influence, put the stormy individuals back on an even keel. If Wilma, our weldor, finds a helping hand from this counselor, and thereby develops into a serious production line soldier, then the success of many other future women war workers can likewise be assured by the same policy.

So with "Wilma the Weldor" rapidly becoming the Prima Donna of the war plants, some enterprising composer of catchy tunes might write her a musical score she can hum to the tempo of her sputtering welding arc.

*The law provides that "Wilma" shall have a rest period twice daily, in addition to her lunch period. Here Mrs. Vargo and fellow workers enjoy one of the rest rooms provided at Pullman-Standard. Housemother Mrs. Agnes Marinak is helping to make them comfortable.*

# "Keep 'Em Sailing!"

**"Tasco" saves dollars and days by using the metallizing process to build up worn parts, correct errors made in machining and restore galvanized coating. In one year, over 72 miles of zinc wire were atomized and sprayed.**

*By* **CHARLES BOLTON, JR.**
**Assistant Welding Engineer,**
**Tampa Shipbuilding Co., Inc.**

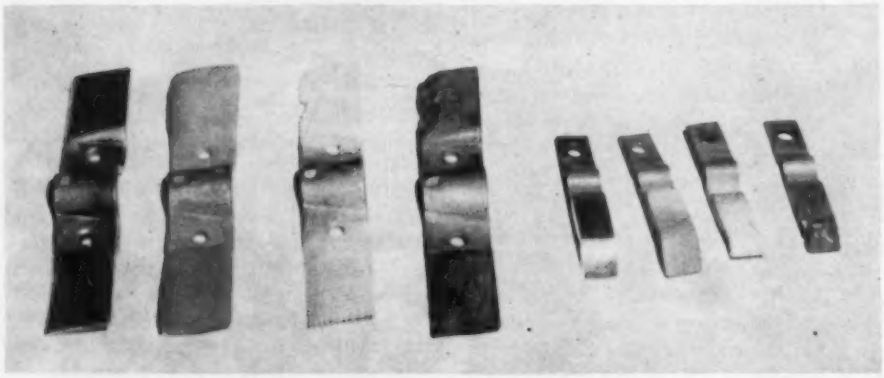


*Fig. 1—Worn switch fingers may be built up by spraying them with copper. Right to left in each size: the finger as received, the finger prepared for bonding, the finger after spraying and the product polished to contour.*

TAMPA SHIPBUILDING CO., Inc., has made wide use of the metallizing process for the past several years. The applications at "Tasco" range from very small operations up to work involving hundreds of pounds of deposited metal and requiring continuous spraying for periods as long as 72 hours. The types of metallizing wire used include zinc, brass, copper and various carbon steels. In the past twelve months, over 72 miles of zinc wire have been atomized and sprayed to provide corrosion protection to millions of dollars worth of Navy equipment.

Metallizing guns have given excellent service in all of the various applications. They have proved dependable, easy to operate and simple to maintain.

All metallizing is performed by the galvanizing department. J. E. Hardin, department foreman, gives considerable personal attention to metallizing work. Direct supervision of all applications rests with Clarence C. Blount and J. B. Blanchard, first and second shift leadermen respectively. C. W. McLendon is the man in charge of maintenance, repair and adjustment of the equipment.

The accompanying pictures, reproduced through the courtesy of the Metallizing Co. of America, illustrate several highly important applications.

*Fig. 2—This shaft is being reclaimed for service with sprayed steel.*

### Worn Switch Fingers

Copper switch fingers, to cite our first example, wear rapidly, are expensive to replace and are of critical material; we therefore save both time and money by building them up with sprayed copper. The fingers shown in Fig. 1 are of two different sizes. From right to left, in each size, are the worn finger as received to be repaired, the finger cleaned and prepared to receive the sprayed copper, the finger after being sprayed and the finished product after being polished to a contour identical to a new finger. It is estimated that this operation alone saves annually 1,800 lb of copper and $1,000.

Worn shafts, both large and small, are reclaimed by metallizing and then machining them to their original

*Fig. 3—The large circular weldment weighs 13,000 lb. Too much metal was removed through an error in machining, and over 30 sq ft on the inside surface had to be metallized in order to salvage the company's heavy investment in the piece and allow the ship to sail as scheduled.*

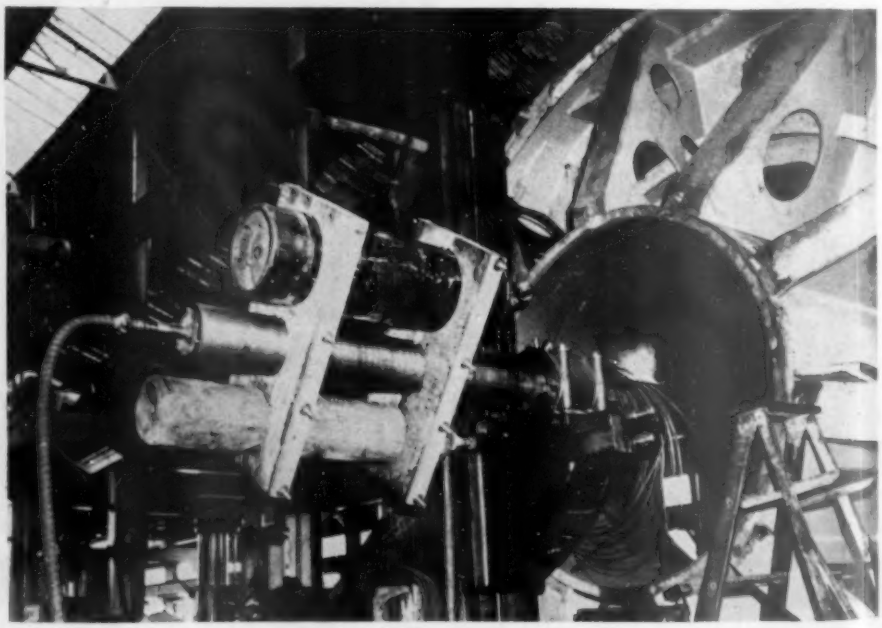


*Fig. 4—Zinc is sprayed on the welded seam to protect this bulkhead against corrosion.*

dimensions. In operation throughout the yard are large numbers of shaft-driven machines having a particular size of shaft that wears rapidly. The shafts received for repair are prepared to receive sprayed steel and then built up by metallizing as shown in Fig. 2. This is followed by machining, resulting in what looks and wears like a new shaft.

### Add Metal for Remachining

One of the largest jobs performed by metallizing is illustrated in Fig. 3. The large circular weldment shown mounted on a boring mill is part of a 45-ton boat and airplane crane and weighs over 13,000 lb. The interior of the cylinder required machining to a press fit. A mistake during machining caused excessive material to be removed from half of the cylinder, an area of over 30 sq ft. After careful consideration, it was decided to rectify the blunder by metallizing.

This weldment had to be fabricated to extremely close tolerances. Its critical dimensions had been carefully controlled during assembly on the slab, and it had been completely stress relieved prior to machining so that no distortion would occur. Because of the large number of welding and cutting man-hours required to fabricate this weldment, as well as material and heat-treating cost, it represented an investment of several thousands of dollars prior to machining.

From the standpoint of money alone, it was imperative that this piece be salvaged. And money was by no means the only consideration. The ship on which the big cylinder was to be installed was being rushed to completion to meet an early delivery date. Any method of salvage which might introduce distortion would have necessitated an additional heat treatment of the entire piece—an impossible delay which the metallizing process avoided.

By using an ingenious method of attaching the oxygen and acetylene tanks and air hose to the boring bar (refer again to Fig. 3), it was not even necessary to remove the weldment from the boring mill. The metallizing gun was mounted on the regular cutting arm, and the gases were fed through ¼ in. brass tubing. The tubes were placed on the keyway of the boring bar, thereby permitting them to pass through the bearing without any tangling. As is also indicated in Fig. 3, the steel metallizing wire is looped over the boring bar.

*Fig. 5—This steel chest was fabricated by welding galvanized sheet metal. The welding heat destroyed the galvanized coating along the seams, but the metallizing gun quickly restored it.*

Prior to spraying, a series of circumferential cuts were made in order to roughen the area sufficiently to assure an adequate bond of parent and sprayed metal. Approximately 200 lb of steel were continuously sprayed during this operation. When the spraying had been completed, the gun was removed and the arm refitted with a cutting tool. The cylinder was then machined to the correct dimension, giving a perfect surface for the press fit.

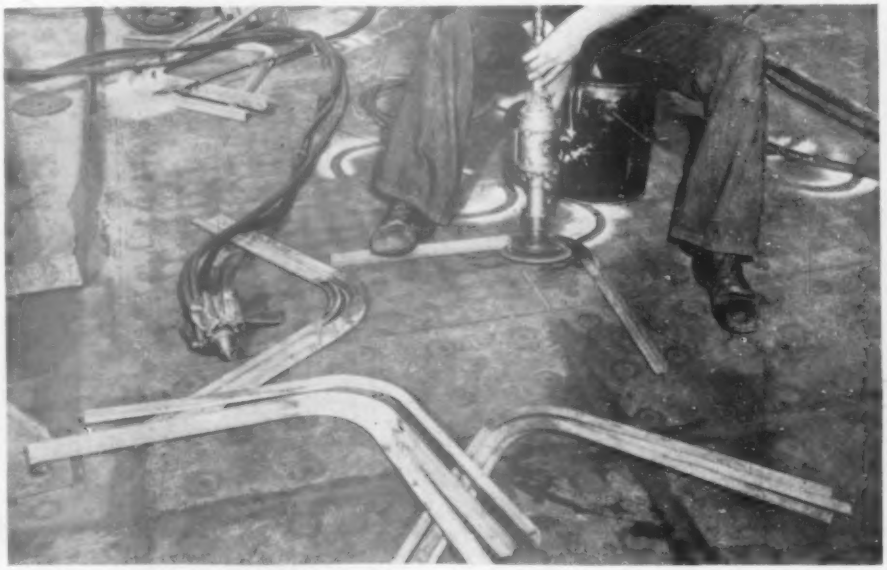
### Restoring Zinc Coatings

The application of zinc by metallizing is used extensively in this shipyard. Zinc is sprayed in sections from small brackets to large bulkheads (Fig. 4) in order to restore galvanizing damaged by the heat of welding. In Fig. 5, a steel chest with welded seams is being sprayed with zinc to provide a galvanized finish. The surface was prepared for metallizing by wet sandblasting.

When galvanized angle iron is bent to form the small brackets shown in Fig. 6, the heat of bending frequently injures the galvanizing. The damaged coating is restored by metallizing with zinc. In the illustration, the operator is grinding the rust from one bracket preparatory to spraying. The brackets at the right are as received prior to cleaning, those at the left have been cleaned and those in the center have been sprayed.

All in all, metallizing effects many economies which could not be realized by any other process. Definite savings of thousands of dollars yearly are effected—to say nothing of the satisfaction of knowing that we have a tool which will save many a job from being scrapped or will reclaim machine parts so that Tasco can "Keep 'em Sailing."

*Fig. 6—These brackets were bent from galvanized angle iron, and the coating was naturally damaged at the point of bending. The operator is grinding the rust from one bracket prior to spraying it with new zinc.*



# Short Cuts and Kinks • • •

## The Exchange of Ideas Leads to Progress

### Help Wanted, *please!*

**THIS is the one place where you may "get more than you put in," for all the ideas given here are yours without contributing anything in return. Don't be that kind of fellow, though! If you have a welding idea to pass on, then get the kick of seeing your name in print, help others to win the war and help us to keep this feature alive. Send anything you think suitable to Short Cuts and Kinks, THE WELDING ENGINEER, 506 South Wabash Ave., Chicago 5.—*The Editors.***

### Batten Clip Jig

***By John H. Chaflin***

I SUBMITTED a suggestion to the Labor Management Committee at Oregon Ship for a jig to support large numbers of batten clips staggered. Its purpose is to permit one end of each clip to be flame-cut at an angle when a single straight-line cut is made. This idea won one of the prize awards.

Batten clips are received with both ends cut square, as shown by the dotted line in Fig. 1. One end of each clip then has to be cut to fit the angle of the hull as it converges toward the stern. Half the clips are cut as shown for the port side of the ship and a like number are cut at an opposite angle for the starboard side. Prior to my suggestion, each clip had to be measured and its proper angle marked with a soapstone line to guide the operator. The clips were then flame-cut, one at a time.

The jig which I suggested is made of two pieces of angle iron. These pieces are cut into a number of divisions which are bent to hold 19 batten clips on each side at the desired angle. Fig. 2 shows one clip in place in the jig. After the jig has been loaded, the catch (Fig. 3) is released, and the marking bar is moved down on the clips as shown. This bar serves as a straight edge for marking the line to be cut across each clip with a soapstone stick. All 19 clips are marked with a single stroke of the stick.

The right half of the jig is built similarly, with a bar to mark the clips on the second angle iron at the other angle. The bars are released and held up by their respective catches while the flame-cutting operator cuts along the soapstone lines. The end pieces fall away, and the cut clips are dropped into boxes, one for each side of the hull.

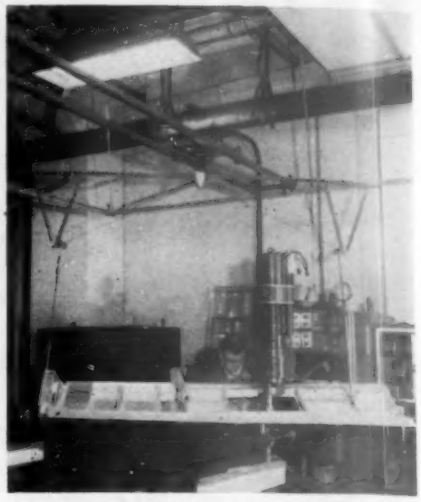
This jig is easily and quickly filled with clips, all of which are marked without measuring. The flame-cutting torch operator cuts a large number of clips with a single straight cut, making it an ideal production set-up. The jig is emptied quickly by lifting one end, which automatically dumps the clips into separate boxes where they are ready for use. This suggestion has speeded up the cutting of batten clips by at least 50%.

» «

### Support Speeds Welding

AN OVERHEAD support, similar in construction to a small crane, is providing the answer to one of the main limitations on the use of spot welding—the size and weight of assemblies that can be handled—at The Glenn L. Martin Co., Baltimore. Traveling on small rollers on an overhead track, the crane-like support can be moved almost effortlessly in any lateral direction.

The support is of extremely simple construction, consisting of a horizontal beam which pivots from a supporting trolley on a pin which permits 360 deg rotation. The assembly to be spot welded is suspended from this beam by springs attached by means of quick acting clamps, and is counterbalanced for easy handling.



***Heavy assemblies for spot welding are easily handled by this overhead trolley.***

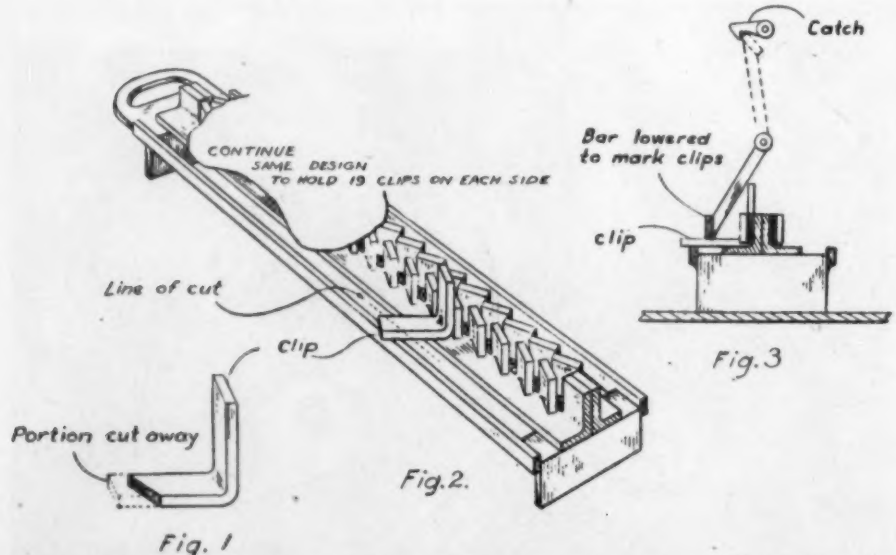
Not only has this new arrangement cut down on spot welding time, but, more important, it has permitted the redesign from riveting of parts such as bomb bay and wheel well doors (formerly considered impractical for spot welding due to their size and weight) to take advantage of the more highly productive spot-weld equipment.

» «

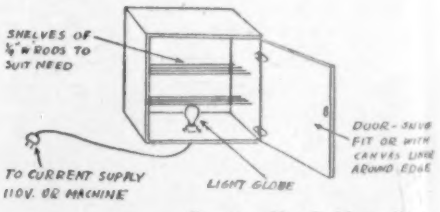
### Lighted Electrode Cabinet

THE accompanying sketch shows an electrode cabinet which may be built from scrap sheet and proportioned to suit individual requirements. With a 100 watt bulb in the bottom and a snug fitting door, this cabinet will keep the electrodes warm and dry. They will stay dry even though no other source of current is available except from the welder and that only during the normal working shift.

"In the South," writes the welding supervisor who contributed this suggestion, "we had considerable trouble keeping electrodes dry until we built such lockers. Our electrode waste due to dampness is now negligible."




***Jig for holding batten clips while their ends are flame-cut. Fig. 1 shows the cut clip; Fig. 2 the bent pieces which hold it at the proper angle; Fig. 3 the method of lowering the marking bar.***


SHELVES OF ½" W RODS TO SUIT NEED
DOOR - SNUG FIT OR WITH CANVAS LINE AROUND EDGE
TO CURRENT SUPPLY 110V. OR MACHINE
LIGHT GLOBE

*Courtesy, Harnischfeger Corp.*

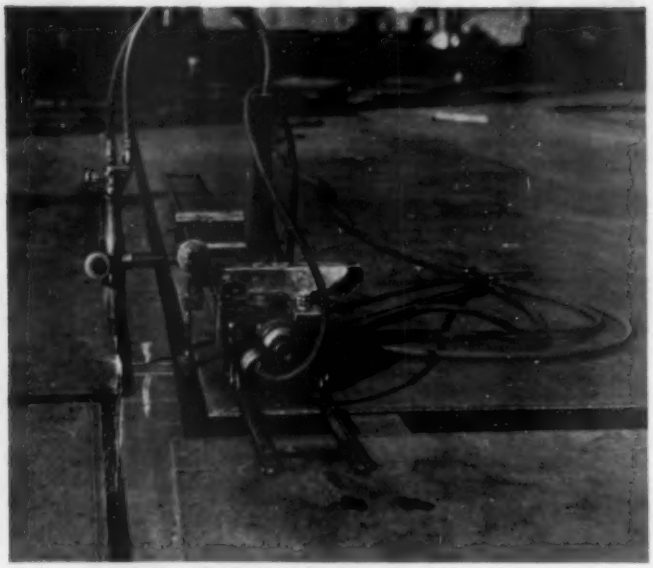
***Sketch giving construction details of a cabinet that will keep electrodes dry.***

# STREAMLINED

Tube-Turn welding fittings help to bring true streamlining to a piping system. They not only save space and weight, but permit neater layout and *more compact design*, with lines of piping nestling closely together, hugging walls and making the best use of corners or odd spaces. Insulation is far easier in piping systems where Tube-Turn welding fittings are used.

Tube-Turn seamless steel welding fittings themselves are basically streamlined. Their smooth inner surfaces, easy sweeping turns and full circularity reduce pressure loss and flow resistance at vital points where flow direction changes. No flow-impeding "offsets" where Tube-Turn fittings are used — no waves or ridges to accelerate corrosion or erosion! Write for Catalog 111.

TUBE TURNS (Inc.) Louisville, Kentucky. *Branch Offices: New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Houston, San Francisco, Seattle . . . Distributors located in all principal cities.*



*Left: Cutting machine attachment. The roller guide insures that the plate being cut will have an edge parallel to the previous plate.*

## Roller Flame-Cutting

*By N. G. Bellrose and W. H. Dice*

WE SUGGESTED a roller attachment for a flame-cutting machine which eliminates all layout. Normally, it takes a layout man and helper from 30 minutes to one hour to lay out shell or deck plates to be cut. The flame-cutting operator is then required to hook up two torches so that two plates may be cut at the same time. The difference in expansion, however, may make it necessary for many of these plates to be recut to insure true edges.

The attachment we suggested was adopted by the Labor-Management Committee at Calship. It is connected to the flame-cutting machine preparatory to making parallel cuts. Instead of the previous two torches, we use one torch guided by a roller running along the edge of the adjacent plate. This device saves the oxygen and acetylene required for the extra torch and also cuts down fitting time. The fitters are now provided with plates that have absolutely parallel (though not necessarily perfectly straight) edges.

Using this device, about 1,500 feet of roller cuts are made every 24 hours (3 shifts) or approximately 45,000 feet per month. Under previous practice, this would have meant 90,000 feet of flame-cutting. The adoption of our suggestion has, therefore, resulted in the saving of the oxygen and acetylene that would normally be required for 45,000 feet of flame-cutting per month.

» «

## Round Bar Storage

LARGE diameter rounds are difficult to store because of their inherent tendency to roll. The accompanying illustration shows how such stock may be stored safely, quickly and neatly by using cradle supports. The cradles pictured were made of 1¼ in. bar stock to accommodate rolled stock of medium diameter. Flanges are welded on the inside to prevent the rounds from being rolled in the cradle and on the outside to prevent the cradle from being moved out of the vertical position. These cradles can be moved from one part of the plant to the other since they are not bolted to the floor. In spite of their mobility, they hold the rounds securely and safely.

*Right: The cradles were made to hold round bar stock—always a troublesome item to store in any fabricating shop.*

*Courtesy, Westinghouse Electric & Mfg. Co.*

» «

## Resistance Welder Care

*By E. R. Spittler*

General Electric Co.

A RESISTANCE welder should be given the same consideration and careful maintenance as a milling machine, lathe or any other precision machine tool. A regular "preventive maintenance" schedule should be adopted, permitting periodic inspection to be made of the parts that need replacement.

Obviously, this short article can not give detailed recommendations on the proper maintenance procedures. It is possible, however, to point out the units that require special attention and to give a few broad hints as to proper care.

**Transformer:** If the welding transformer is water-cooled, be sure that a free circulation of water takes place at all times during the operation of the machine. Blow out all dirt, dust and grit from the transformer and secondary circuit at least once a week.

**Switches, Contactors, Timing Devices:** These "nerve centers" must be kept in good condition, mechanically and electrically, to assure efficient operation of the welder. They should be checked every two months for such things as evidence of wear, oxidation at fuse connections in switches, loose electronic tube sockets, loose wiring in timing devices.

**Electrodes or Dies:** Burned or pitted electrodes, welding wheels, dies or mandrels are a constant source of trouble. Frequent refacing of the working surfaces of these parts is excellent insurance against poor welds. Checks should be made to see that a full flow of cooling agent is being maintained while the machine is in operation.

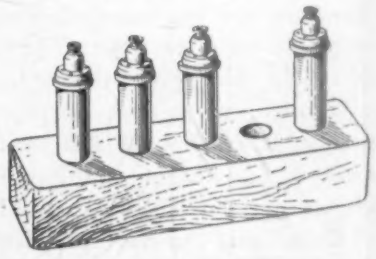
**Clamps and Fixtures:** The accuracy of the welded assembly can only be as good as the fixture holding it in place during the welding cycle. It is evident that close inspection and frequent adjustment of fixtures must be made.

**Oiling:** Oil and grease all moving parts at regular intervals to assure smooth, even motion and minimum wear. In doing this, take care not to drop oil or grease on any of the electrical wiring or connections.

**Pressures:** All welding machines have some device for establishing welding pressure. Usually, it consists of an air or hydraulic cylinder, or of a cam or toggle with spring arrangement. The pressure system should be inspected periodically and kept in perfect condition at all times. All air and oil filters should be cleaned at regular intervals.

» «

## Tip or Nozzle Rack



*Courtesy, The Linde Air Products Co.*

*Damage to valuable torch tips when not in use is prevented by this simple rack.*

TO prevent the damage to cutting torch tips and nozzles which results when they are knocked against each other or against other tools, a suitable rack or block will prove invaluable. The nozzle block shown here is but one of many different types that can be made in a few minutes by drilling holes of the proper size in a suitable block of wood.

# PAGE *Welding* ELECTRODES

THEY HAVE TO BE GOOD

MAKING electrodes is highly technical work. Analysis of the wire—type, thickness, hardness and concentricity of the coating—all chemical and physical characteristics must be held to close tolerances to insure uniform welds and satisfactory production.

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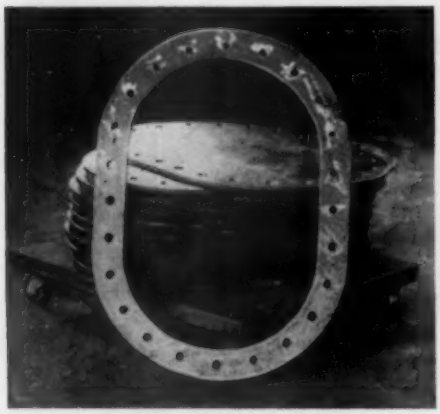
# On the Job

## Cutting "Obrounds"

A SOUTHERN CONCERN was faced with the production of 700 "obround" ship manhole covers and manhole gasket frames (Fig. 1). The covers, measuring 22 by 30 in., were to be cut from ½ in. plate, and the gasket frames, measuring 21 by 29 in. OD and 16 by 24 in. ID, were to be cut from 1 in. plate.



*Courtesy, The Linde Air Products Co.*

***Fig. 1—These "obround" ship manhole flanges are cut from 1 in. plate in one pass of a portable cutting machine.***

It was first planned to make the lengthwise cuts with a straight-line cutting machine operating on a track and to make the semicircular end cuts with a hand-cutting torch mounted on a radius rod. Since this would have necessitated rather heavy initial expense for the equipment, a portable cutting machine was adapted to cut out these parts at a single pass.

The frames were cut at the rate of 6 minutes each actual cutting time, or 10 minutes each overall time (including time for moving the machine). The manhole covers were cut at the rate of 5 minutes each, 10 minutes overall.

To make the set-up, a rider plate or template of ½ in. steel was cut and slotted in the middle to permit travel of a ball-bearing center, which was mounted in the standard radius bar clamp on the machine frame. A guide rail fashioned from ¼ by ⅛ in. bar stock was tack welded to the rider plate so that it would bear lightly against the machine drive wheel. This prevented any possible tendency of the drive wheel to turn inward as the center moves down the slot in the rider plate.

A cutting torch was centrally positioned in the conventional manner to make the inside cut on the flanges. For the outside cut, an additional torch was clamped to the hand wheel and attached to the lower end of the machine body with an adjustable bracket. The bracket permitted the nozzle to be moved inward or outward, thus making it possible to narrow or widen the distance between the two cuts. The outside torch was fitted with a bevel-cutting adaptor so that the cutting-oxygen stream would be perpendicular to the surface and produce a square-edge cut.

Oxygen and acetylene were supplied by a single set of hose lines fitted with "Y" connections to permit branch lines to each individual torch. A needle valve was installed in each main hose line. With this arrangement, the individual torch valves were used only to light and to extinguish the torch.

Both torches were equipped with high-speed nozzles and were operated at 75 psi oxygen pressure on the ½ in. plate for the covers and at 95 psi on the 1 in. plate for the gasket frames. Two nozzles were employed for each torch; while one was in use, the other was kept immersed in a solution of nozzle-cleaning compound. The effectiveness of this procedure is apparent from the fact that the original set of nozzles was still going strong after 3,000 starts—all starts being made without benefit of prepiercing from a hand torch.

Cutting is started with the machine at the far end of the straightway. As the cut progresses around the curve, the machine pivots about the center, which has moved to the end of the slot in the rider plate. The pivoting action causes first one and then the other of the machine's rear casters to cross the slot, each crossing at the same point. To facilitate the crossing, the operator inserts into the slot a small block of the same thickness as the rider plate. The block is mounted on a wire handle for convenience in removal and insertion.

When a piece is completed, the rider plate with the machine on it is slid as a unit into position for the next cut (Fig. 2). Vertical eyes tack welded at either end of the rider plate allow the assembly to be dragged from one position to the next by means of a length of heavy wire, bent to form a small hook at one end. It is unnecessary to lift the machine or to move the large plates from which the parts are cut.

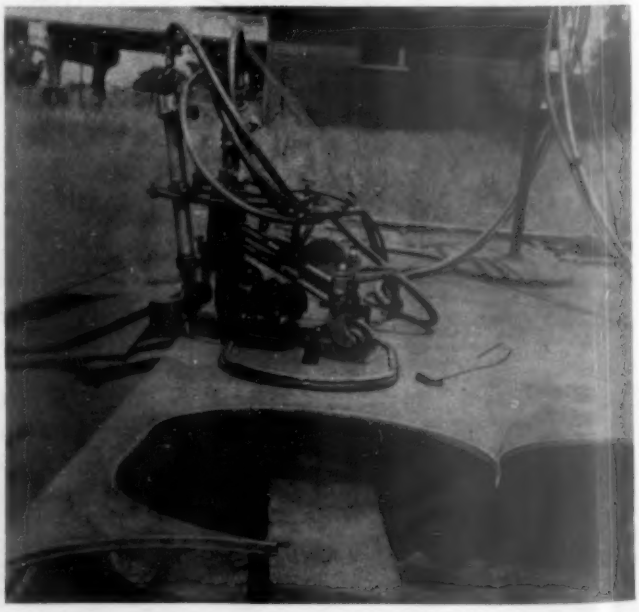


***Fig. 2—The machine and rider plate are moved as a unit from one position to the next without disturbing the set-up.***

*Courtesy, The Linde Air Products Co.*

## Arc Welding Cast Iron

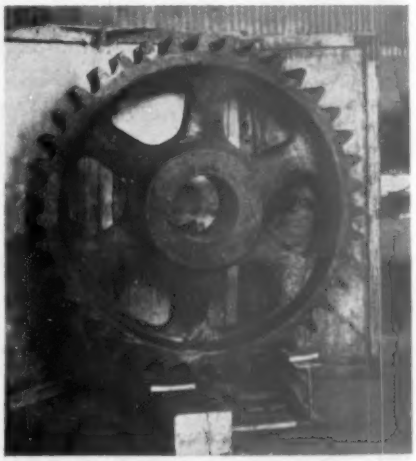
***By Chester L. Wright***

THE CAST IRON gear shown in the picture below had two broken spokes, and the rim was also broken near a third spoke. This gear weighs about two tons and cost $300 new. It was decided to repair it by arc welding with cast iron electrodes.

The work was prepared for welding by veeing out the cracks with a power-driven chipping hammer and placing a number of studs in near the vee. The writer has had success in arc welding cast iron without studs, but he deems it advisable to use them in the heavier sections.

The welding was done piecemeal in order to avoid throwing too much heat into the gear at any one time, and peening was used frequently. Peening is of great value in the welding of heavy cast iron sections, but, in the writer's opinion, it would probably do more harm than good to peen light sections.

***Can cast iron be successfully arc welded? Yes, this repaired two-ton gear shows.***



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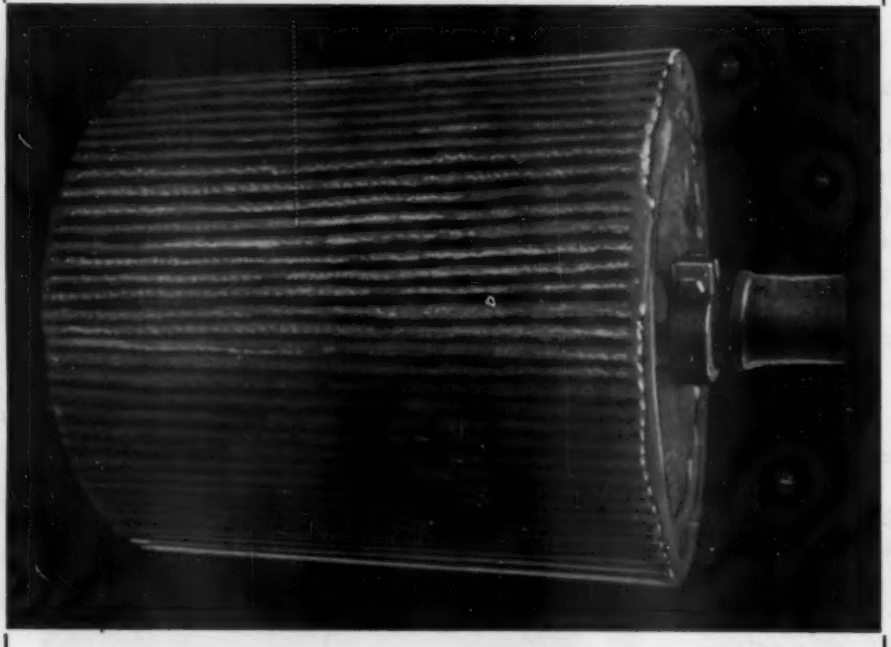

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## Welded Retractable Boom


*By Stephen E. Stawiarski*

Formerly U. S. Army Air Corps*


DURING the four years I served in the United States Army, I designed and constructed an arc-welded boom with retractable supporting wheels for lifting engines, propeller assemblies, tail ends of planes, in fact, all general hoisting operations.

The boom was constructed of 1 and 2

*Official U. S. Army Air Corps Photo, Courtesy of The Hobart Brothers Co.*

***This boom is mounted on a five-ton tractor in order to lift heavy parts and subassemblies of planes. Note the retractable supporting wheels.***

in. aircraft tubing with a ¼ in. wall thickness. The base is slotted and held by 1 in. bolts to two uprights, which are made of armor plating and set immediately in back of the bumper of a five-ton tractor. The boom was designed for lifting ten tons, but it obviously could not attain its maximum capacity when mounted on a tractor of only half that weight. Therefore I designed a retractable wheel assembly which acts as a fulcrum and holds the tractor on an even keel when it is hauling excessive loads around the air field.

The supporting wheel assembly was made retractable so that the tractor could move the weight on the boom and deposit it with the least effort, saving time which is so valuable to Army Air Force units. In the down position there is a clearance of only ¾ in. above the ground. The wheel assembly is raised when the boom is idle, and it is not in the way even when the tractor is traveling at a fast speed over rough ground while on its way to service planes.

* Mr. Stawiarski, a former staff sergeant in the U. S. Army Air Corps, recently received an honorable medical disability discharge and is now engaged in designing and fabricating materials for war industries.

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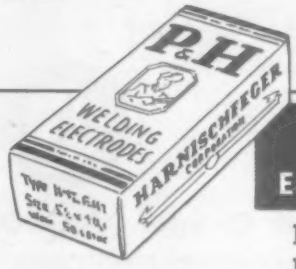


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## Loyal Quartet

LOYAL to their company and to the war effort is the quartet of women weldors shown in the picture on the right. The members of this welding foursome have all been on the job in the miscellaneous weld shop of Lukens Steel Co., Coatesville, Pa., without a day's absence in over a year. And they combine the everyday chores of homemaking with their war jobs—two of them are mothers.

Mrs. Margaret Kauffman, mother of a small daughter, has worked 70 weeks, 420 work days without being late or absent. Helen Kostelansky has been late only twice during 71 weeks, 426 days of otherwise perfect attendance. Miriam Horst, small in stature but big in determination to help win the war, hasn't missed a day's work in 56 weeks. But the no-absenteeism record is topped by Mrs. Anne Doherty, mother of two daughters, who has 72 unmarred weeks, 432 work days to her credit.

Each of these ladies also invests at least 10% of her wages in U. S. War Bonds.

*Left to right: Mrs. Margaret Kauffman, Helen Kostelansky, Miriam Horst and Mrs. Anne Doherty. Each of these women welders has worked at Lukens Steel Co. for over a year without a day's absence.*

» «

## Portable Safety Shop

TAKING a leaf from the book of the old-time itinerant peddler who used to tour the countryside to bring "city goods" to farm wives, Walter Kidde & Co., Belleville, N J.. manufacturer of fire extinguishers and other safety equipment, is beating accidents to the punch with a mobile safety shop. This shop travels from plant to plant giving workers the opportunity to purchase protective clothing on the spot. It is stocked with safety shoes, goggles, face shields, respirators, gas masks, aprons, smocks, gloves, caps, etc.

*Safety shoes will practically eliminate foot accidents, it is claimed at Kidde's traveling shop. Emphasis is laid upon the fact that one-third of 1943's lost time was due to foot injuries or to accidents caused by slipping.*

The shop is rolled to workers at their machines, where garments are fitted by the safety serviceman or arrangements are made for the cleaning or repairing of worn safety equipment. The safety shop stays three or four days in each plant. Its slogan is: "No one wants to be injured; no one wants to lose time; no one wants to lose pay."


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2 Welded "tacks" — hold bushing and flange in place.

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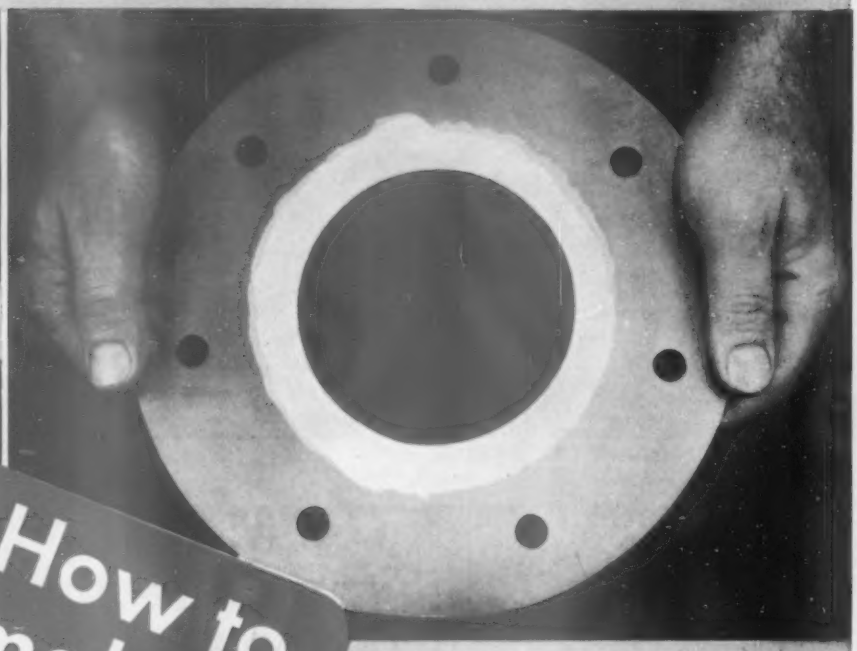
4 Welding with Ampco-Trode — showing the partial fillet as the weld is applied.

5 The finished weld—with physical properties comparable with those of cast Ampco Metal.



6 The completed job — showing weld on base of flange after machining.

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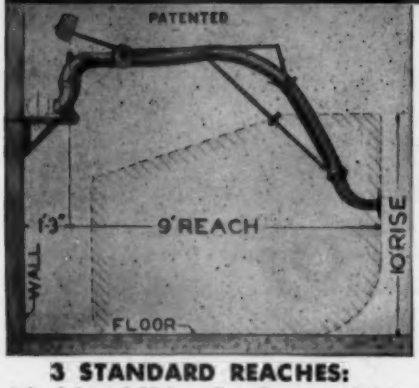


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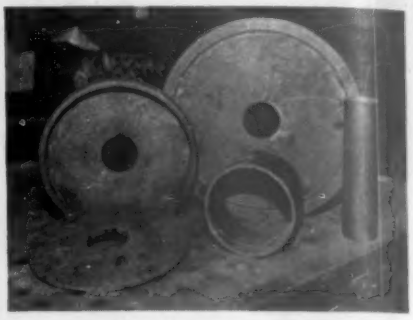
## Welded Winches

*By A. F. Davis*

CAST STEEL WINCHES for landing barges were "unobtainable" in the time required so an order for all-welded winch equipment was given to the Southwest Ornamental Iron Co., Kansas City, Mo.

The body of the winch drum was made up of various members (Fig. 1) consisting



*Courtesy, The Lincoln Electric Co.*

***Fig. 1—Components of winch drum assembly before welding.***

of tubular shapes and flat circular pieces of mild carbon steel. The largest circular piece measured 17 in. in diameter. These parts were first tack welded to alignment and then finish welded in a hand-rotated positioning jig (Fig. 2). Use of this jig, it is stated, resulted in a saving of 20% in welding time.

Seventy per cent of the joints were fillet welds. Intermittent welds were used on some of the more critical parts in order to effect a more even heat distribution and minimize distortion. All welding was done with $\frac{3}{16}$ and $\frac{1}{4}$ in. shielded-arc mild steel electrodes. Single-pass technique was used throughout with the exception of the gear blank, which was veed at the edges and

*Courtesy, The Lincoln Electric Co.*

***Fig. 2—This hand-rotated positioner was used to permit continuous downhand welding on a drum.***

welded in three passes. The gear teeth and brake drum were machined after welding had been completed.

The shaft mountings and base were fabricated of $\frac{3}{8}$ in. plate by fillet welding in a single pass.

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## Refacing Worn Car Wheels

ABRASION-WORN flanges of car wheels are rebuilt by hard-facing in the repair shops of the Philadelphia & Western Railway Co. The flanges can be refaced approximately four times before the treads

*Courtesy, General Electric Co.*

***The flange of this car wheel is being built up by multiple-pass hard-facing in the repair shops of the Philadelphia & Western Railway Co.***

of the wheels become worn to the point where they have to be scrapped. The treads are not hard-faced because of the possibility of fracture while in use on the company's high-speed line between Philadelphia and Norristown, Pa.

The work is done on a special support designed to facilitate the rebuilding of the flanges. Before hard-facing, the wheel is preheated with a torch to 350 F. The machine is set at 250 amp, straight polarity, and a single-layer bead is welded with a weaving motion on the worn surface of the tread around the entire circumference of each wheel. A ¼ in. chrome-manganese hard-facing electrode is used. The width of the bead is determined by the use of a template, and care is taken to meet the flange with exactly the proper degree of penetration.

After slag and spatter have been removed by light grinding, a second, a third and (if necessary) a fourth hard-facing layer are added. Each layer covers a little more of the flange until it has been built up to its proper height as determined by the template.

The hard-faced wheels are suitably covered to protect them from room temperature so that they will cool gradually and avoid cracking. After a cooling period of about 12 hours, the treads and refaced flanges are finished by very light grinding, and the wheels are then ready to be put back in service.

The company inspects every car completely at regular intervals, keeping a record of the condition and mileage of each wheel. The wheels are inspected by comparison with a template conforming to the contour of a new, unused wheel.

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# Welded Processing Machine

**Both strength and rigidity had to be obtained in a machine to process insulation material for buildings. An arc-welded structure gave both and resulted also in a considerable dollar saving in production costs.**

*By* **L. J. SCHWARTZ***

**Plant Engineer, Metalated Wool Insulation Co., Detroit**

FORMERLY we used a machine of the bolted and riveted type to process insulation material for buildings. The material handled consists of a rock wool blanket encased in a cover of craft paper and heavy aluminum foil. Even though it had a framework of 2 by 2 in. angle iron, 3/16 in. thick, the riveted machine could not withstand the shock of loading this heavy material. The loading would frequently result in misalignment of various parts of the machine, causing shutdowns and delays. It was decided, therefore, to turn to arc-welded construction.

### All-Welded Unit

The new machine was built of 3 by 1½ by ¼ in. steel channel weighing 4.1 lb per ft. The ends of the channel members were chamfered by grinding to obtain deeper penetration of the weld beads and to permit grinding flush after welding.

The legs were first welded to the frame, as shown in Fig. 1. Next the headers (risers) to which the roll bearings are mounted were added. These members, which are of 2 by 6 by ¼ in. channel, were aligned by clamping two straight edges to their faces and then squaring, truing and shoring as shown in Fig. 2. Thirty-six inches of welding were required for this part of the job.

The cross members were welded horizontally at the bottom of each set of legs and were tapped for ½ in. cap screws for use in leveling the machine. Other horizontal 3 in. channel members run lengthwise of the machine, 6 in. from the floor, in order to hold the legs in alignment.

### Welding the Rolls

The hollow steel rolls (Fig. 3) were made of 12 in. seamless steel tubing of ½ in. wall thickness. End plates 1 in. thick were welded to both ends of each tube, and short lengths of 2⅝ in. tubing were mounted (to absolute centers) on each end for bearings. The welds had to be liquid-tight in order to keep asphalt (in which the rolls run in a constant bath) from seeping inside and causing uncontrolled combustion.

*From a paper submitted in the Industrial Progress Award Program sponsored by the James F. Lincoln Arc Welding Foundation.

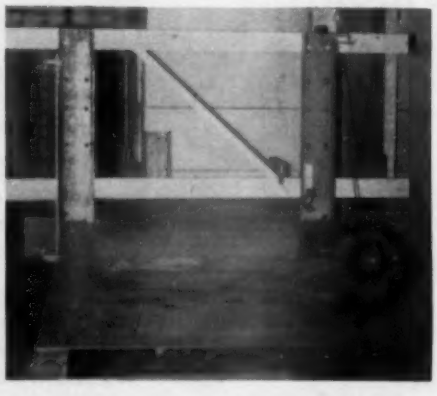

*Fig. 2—Method of aligning framework.*

Arc welding was used on the rolls in order to minimize distortion. Each roll required some 91 in. of welding or a total of 364 7/16 inches for all four rolls. After welding, the rolls were ground and heat treated.

### Production Savings

In operation, these rolls are heated to an external temperature of 350 F by a premixed gas-air flame. This method of heating permits us to use an asphaltic adhesive at a cost of $9 per barrel in comparison to a rubber compound at $55 per barrel, which we had to use on the original machine. With the new welded machine, our production cost per thousand square feet has dropped from $2.20 to $0.36, or a saving of $73.60 in an ordinary working day. The saving in processing has been passed along to the consumer, thereby raising the demand for the product considerably.

Notwithstanding its many advantages, the new machine cost much less to build than did the old machine. The latter cost $3,820; the new machine $1,640, saving us $2,180 per unit.

Even though the new machine weighs more than the old and has been moved and rolled about, it does not show any signs of misalignment. The redesign of this machine has also permitted us to increase the diameters of the paper rolls from 18 to 36 in. Thus fewer shutdowns are required, and we were enabled to raise production from 25,000 to 40,000 sq ft of material per day.

*Fig. 1—Arc-welded frame of machine to process insulating material.*

*Fig. 3—Seamless steel rolls as welded to their bearings.*

# HERCO ARC WELDERS

## THE RESULT OF YEARS OF THE MOST EXACTING RESEARCH IN THE WELDING TRANSFORMER FIELD

### PRECISION CONTROL

Variable Core construction permits stepless heat changes while welding. Magic Eye-Pilot indicates when machine is on.

### STREAMLINED ARC

Instantly starting, smooth, flexible. Elimination of "arc blow" produces sound, speedy and uniform welds. X-Ray test beads.

### LOWER COST

Power cost 50% lower than motor generators. No rotating parts at all, therefore supervision, oiling, replacement of wearing parts eliminated.

### POWER FACTOR

corrected welders if desired.

### MODELS

available from 150 to 2000 amperes.

### OTHER PRODUCTS

*Manufactured by Hercules are*

**MAGNETIC ALIGNERS**
**AC-DC RECTIFIERS**
**HEAVY DUTY—THREE PHASE SOLENOIDS FOR AUTOMATIC SPOT WELDING**

**WRITE FOR LITERATURE**

### HEAVY DUTY CONSTRUCTION

Continuous 24 hour per day operation. Sturdy connectors, on-off switch or circuit breaker for lifetime of wear. Spun glass insulation.

Durable sheet-steel housing. Easy rolling, portable.

VC—250
(40 - 250 amps)

VC—375
(50 - 375 amps)

## HERCULES ELECTRIC & MFG. CO. INC.

MANUFACTURERS OF THE PRECISION WELDER WITH THE

STREAMLINED ARC

2416 ATLANTIC AVENUE · BROOKLYN, N. Y.

# Do You Agree?

*If you, as a reader, do not agree with our answers, let us know your thoughts. Your comments and discussions will be published, too.*

### *Spinning*

*Q*—Reference is often made in sheet metal work to spinning. Is this a forming operation?—*A. B. J.*

*A*—Spinning is a mechanical process for shaping shallow vessels from metal discs. The disc is shaped by rotating in a lathe while a tool is pressed against the peripheral zone. Some spinning operations must be carried out in several stages because of the effects of work hardening. In this event, an annealing operation is undertaken between successive spinning stages.

» «

### *Spot Welding Copper*

*Q*—Is it possible to spot weld copper?—*C. S. W.*

*A*—Certain grades of copper can be spot welded with a copper alloy or a pure tungsten electrode. Copper, however, is very difficult to spot weld because it has a resistance equal to or perhaps even lower than the electrode. If a copper electrode is used, it is likely to be welded to the work. Use of a tungsten or molybdenum electrode avoids this danger inasmuch as these metals cannot be welded to copper. Due to the very high temperatures involved, however, the outside surface may be weakened and a weak, porous weld result.

» «

### *Flame-Cutting Nickel-Clad*

*Q*—I experienced considerable difficulty when I attempted to flame-cut nickel-clad steel. Is it possible to flame-cut this material?—*J. A. B.*

*A*—Yes; nickel-clad plate ¾ in. or heavier can be flame-cut almost as readily and in about the same way as steel plate of similar thickness. The cut is made from the steel side, and the torch head is slanted away from the direction of travel at an angle of about 10 degrees. Possibly you experienced your difficulty because you did not use a large enough cutting tip. A tip one size larger than would be proper for the same thickness of steel (plain carbon) is used with about the same oxygen pressure as for steel.

Plates thinner than ¾ in. may be flame-cut in a similar manner, but considerable grinding and chipping may be necessary as the scarf becomes rough on the thinner gauges. The oxygen pressure should be reduced by about 25% of the pressure normally used for steel plates ⅜ in. thick or under.

To cut holes for pipe fittings and for fabricated tanks, the preferred method is to chip off the nickel cladding to the steel along the line of cut and then cut through from the clad side.

» «

### *Magnesium Arc Welding*

*Q*—According to an article published in THE WELDING ENGINEER, a No. 8 shade lens is satisfactory when welding at 50 amp. Is this true when welding magnesium using the helium-shielded arc welding process?—*D. R. W.*

*A*—The recommendations given in "Weldor's Eyes—Let's Protect Them" (THE WELDING ENGINEER, July, 1943) were for metal-arc welding. When welding magnesium, there will be considerable glare even though only 50 amp current is involved. For this reason, it is recommended that a No. 10 shade lens be used at 50 amp and a No. 12 at 150 amp when magnesium is welded by the inert-gas-shielded process.

» «

### *Speed of Welding*

*Q*—What is meant by the speed of welding?—*T. A. R.*

*A*—All references to the speed of welding have been more or less understood to designate the comparative rate of travel of the electrode or filler metal without regard to the rate of deposition of metal. There is no standard unit of measurement of the speed of welding. As a matter of fact, no one can specify a certain welding speed and be sure of obtaining the desired results unless the amount of current or gas to be used is also specified.


Knock-Out
A. C. WELDERS
The World Over

Engineered correctly by men with years of experience. Silent operation, ease in striking arc, wide range of application, low initial cost, economy of operation, negligible upkeep, burn-out proof transformers, all go to distinguish K-O *Welders*. These time-tested units are made to serve their employer well and show him a substantial profit whether on maintenance or production.

20 to 550 amps.

See your nearest K-O jobber or write for bulletin No. 41-64.

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ABERDEEN, SO. DAK.

# Cut Your Holder Maintenance Cost by 75%

**1 POSITIVE GRIP . . . INSTANT RELEASE**

Less than a quarter turn gives a positive grip on the rod . . . or frees it completely to let the stub drop out.

**2 LONGER-LASTING END CAP**

End cap is not merely a plastic shell, but a metal-backed moulding with the insulation firmly bonded to the metal insert . . . a *stronger* cap that stands up under rough usage.

**3 COMPACT, EASY TO HANDLE**

BALL-GRIP* Holders are light in weight, well-balanced and compact. Rod is held at a slight forward angle for easier handling in all positions.

**4 JOB-TESTED PERFORMANCE**

BALL-GRIP* Holders have put in thousands of hours on the toughest kind of production welding in leading shipyards and fabrication plants. Their record *proves* they stand up longer and cost less to maintain.

***Check these features for yourself . . .***
***Try a BALL-GRIP* on Your Job!***

Write for the BALL-GRIP* bulletin, or see your local distributor for complete information and prices.

● CURVED surface of the ball exerts tremendous pressure on rod, which rests flat against the tapered end of the metal cap insert . . . a positive grip that does not bind or "chew up" the rod, so stub falls free when pressure is released. Current is carried by the cap insert, not the ball.

## FOUR MODELS

| | Net Weight |
|---|---|
| **MODEL A**—(300-400 Amp) . . | 14 oz. |
| **MODEL B**—(400-500 Amp) . . | 21 oz. |
| **MODEL C**—(500-600 Amp) . . | 22 oz. |
| **MODEL D**—(600-700 Amp) . . | 25 oz. |

MANUFACTURED BY

**McCLARY & BYERS EQUIPMENT COMPANY**

731-55th Street, Oakland, California · Telephone OLympic 8189

### *Pack Annealing*

*Q*—I have heard it said that steel sheets are pack annealed. What does this expression mean?—*W. R.*

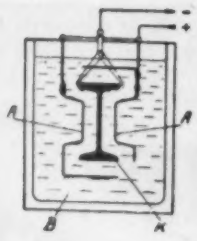
*A*—Pack annealing is the annealing of sheets in bulk; *i.e.*, while they are stacked in a pile. This method of annealing is used to minimize oxidation of the sheets.

» «

### *Galvanizing*

*Q*—How is a steel beam galvanized?—*S. B. G.*

*A*—Galvanizing, a process of coating iron or steel with zinc to prevent rust, may be accomplished by several methods. Probably the most common method is by hot spelter galvanizing; *i.e.*, dipping the piece to be galvanized in molten zinc. Another method is by cold electro-galvanizing. In this instance, the beam would be suspended in a zinc-salt solution (B) as is indicated in the sketch. The zinc is then deposited by electrolysis caused by the flow of current between the cathode (K) and anode (A).




Sherardizing is another process by which steel may be galvanized. This involves heating of the piece in a slowly rotating furnace containing zinc dust. Metal spraying may also be used as a means of applying a protective coating of zinc to steel.

» «

### *Nickel in Steel*

*Q*—What results are accomplished by the addition of the element nickel in steel making? How much nickel is usually added.—*J. E.*

*A*—Nickel is used as an alloying agent in steel in order to increase strength and toughness at low temperatures. In general, quantities range from 1 to 4%, although for special purposes the nickel content may run as high as 36% or more. In all cases, the addition of nickel will increase tensile strength without decreasing the toughness of the steel; there are, however, instances in which the addition of nickel promotes temper embrittlement.

Steels having a nickel content of 24% are non-magnetic, which may be a practical advantage for some uses. When the quantity of nickel is increased to 36%, the coefficient of expansion due to heat (up to 900 F) is very small. In the lower range of nickel up to about 4%—it is usually estimated that tensile strength is increased about 6,000 psi for each additional 1% of nickel.

» «

### *Class E-10010 Electrodes*

*Q*—Is there an AWS electrode classification E-10010?—*R. S. S.*

*A*—There is—one of the E-10000 series of electrodes covered by AWS-ASTM specification A 233-42T for arc-welding electrodes. Class E-10010 is a high, tensile, heavily coated electrode for d-c reverse polarity welding. This electrode is suitable for use in flat, vertical, horizontal or overhead positions and must be capable of producing welds which when stress relieved will have a minimum yield strength of 87,000 psi, minimum tensile strength of 100,000 psi and 16% minimum elongation in 2 in.

» «

### *Calcium Carbide*

*Q*—What is meant by quarter size calcium carbide? How much acetylene gas might a pound of calcium carbide be expected to produce?—*D. J. T.*

*A*—Quarter size refers to a classification of the size of the individual pieces of carbide in a container. Carbide (which is sold packed in metal containers) is classified according to the size of the screen mesh which passes the crushed carbide particles. The commonly used sizes and the screen meshes they must pass are:

Lump size .....3½ in. x 2 in.
Egg size .....2 in. x ½ in.
Nut size .....1½ in. x ⅜ in.
Quarter size .....¼ in. x 1/12 in.

In industrial applications in which commercially pure calcium carbide is used, there is produced an average of 4.75 cu ft of acetylene gas for each pound of carbide.

Name your toughest finishing job... ONE OF THESE SKILSAW TOOLS will do it FASTER, BETTER, EASIER!
• If your problem is grinding down heavy weld beads or removing heavy burrs ... a SKILSAW Portable Grinder will speed the work. If it's cleaning off spot welds, or polishing curved or flat surfaces of any material ... one of these SKILSAW Disc Sanders or Belt Sanders will do the job better, and easier!
SKILSAW Disc Sanders, Belt Sanders and Portable Grinders, like all SKILSAW TOOLS, are built to stand the gaff. They're powered for extra fast work ... streamlined, compact, lighter for easier handling ... and they're better-built throughout for trouble-free performance longer ... at a lower cost.
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SKILSAW Belt Sanders • Do all sanding and finishing on flat surfaces of metal or wood. Powerful, rugged!
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• Planning for After the War? Let Skilsaw Field Engineers help you now to plan "tooling-up" for peacetime production, with Skilsaw's new post-war tools.
SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE

MORE THAN A YEAR AGO there was a breakdown at the Torrington Mills of The American Brass Company. A specially-designed draw bench set up for critical war production was shut down by the fracture of a 5200 pound cast iron cylinder. Regardless of directives and priorities, weeks of time would be required in pattern making, casting and machining before a new cylinder could be installed.

To save time, a bronze repair weld, requiring 196 pounds of Tobin Bronze*, was made by the J. L. White Welding Company, of Waterbury, Connecticut, and production was speedily restored to normal.

Today, more than a year later, this same cylinder with the "temporary" repair weld, is still in operation, having met progressively heavier production demands through the months.

This is one more example of what we mean when we say to American industry "Don't scrap it, *weld* it!" With Anaconda Welding Rods, such as Tobin Bronze and "997" Low Fuming, production schedules have been saved, priceless machinery salvaged, time and time again during this national emergency. 4489

*Reg. U. S. Pat. Off.

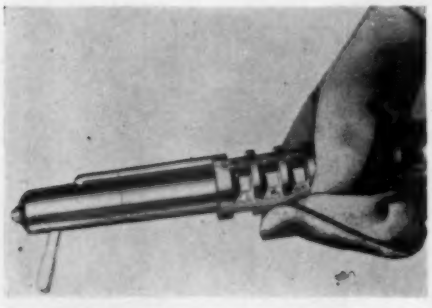
**THE AMERICAN BRASS COMPANY**
*Subsidiary of Anaconda Copper Mining Company*
General Offices: Waterbury 88, Connecticut
*In Canada:* ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

ANACONDA

*Anaconda Welding Rods*

## Holder Improvements

**1** A reinforced snap-on insulator cap is one of the features of the new **"Rod Saver,"** latest addition to the line of electrode holders manufactured by **Martin Wells.** Made of heavy plastic



*Martin Wells' new "Rod Saver" holder features a snap-on insulator cap and other improvements.*

with a reinforced jacket, the insulator cap is notched on the inside so that it will slip over the vise body and be held in place by a steel spring. It does not require screws to hold it, eliminating the danger of arcing due to contact with exposed screws.

The Rod Saver is a lightweight holder (18 oz) and balanced to keep it from tiring the user's hand. The rod hole is set at a 60 deg angle, giving the weldor flexibility and greater ease in reaching tight corners. The hole accommodates electrodes of diameters up to and including ⅛ in. The rods are held securely by the vise body, which provides a positive locking grip of up to 1,000 psi. Having no protrusions, this holder is well suited to work in close quarters, manufacturer declares.

» «

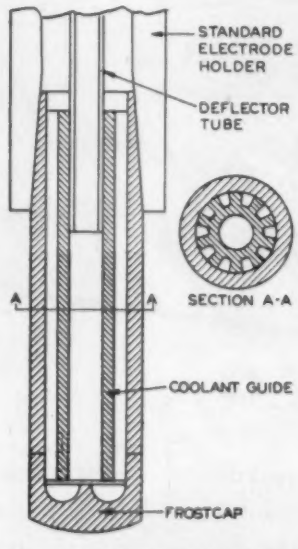
## Refrigerated Electrode

**2** A "self-adapting" spot-welding electrode for use with standard electrode holders when welding in the zero F range is announced by **Frostrode Products.** This new design eliminates the need for adaptors, ordinarily required in order to separate the refrigerant from the water circulation in the holder.

Though intended primarily for refrigerated coolants, the new electrode is completely interchangeable with conventional-type electrodes and can be used with ordinary water-cooling systems. It has an internally finned, replaceable "Frostcap" (tip) and a large number of parallel passages to allow extensive surfaces of metal to come in contact with the coolant during the return flow and thus increase heat dissipation.

These electrodes are available in ⅝ and ⅞ in. OD and in any standard lengths. The replaceable tips can be supplied in either electrolytic copper for maximum conductivity or in Mallory 3 metal for maximum hardness.

**IF YOU wish additional information on one or more of the items described in THE WELDING ENGINEER'S New Products section, please use the coupon appearing below. Simply write in the numbers of the items which interest you, sign your name and address and mail coupon to THE WELDING ENGINEER.**




*Section of self-adapting "Frostpoint" spot-welding electrode. Note the multiple surfaces exposed to the coolant.*

*Three types of welds made with "EutecTrode 2100" on an aluminum casting. Top: single bead deposit; center: weld in a vee groove; bottom: pad built up on a casting.*

## Aluminum Electrode

**3** A new coated electrode has been developed to facilitate the salvage and reclamation of aluminum castings by means of arc welding. **"EutecTrode 2100"** is made of a high aluminum, low silicon composition shielded with a special coating said to insure an even, rapid flow of metal and produce a slag that can be removed by simple wire brushing. It is possible to use this electrode, manufacturer states, without completely preheating the casting and without the danger of overheating the metal adjacent to the weld.

"EutecTrode 2100" has been tested for the addition of metal on faulty or improperly machined castings, for overlaying of improperly cast surfaces, for filling of "low spots" and faultily drilled holes, for overlaying of porous castings and for the welding of castings to aluminum sheets. It has also been successfully used for butt and fillet welds joining aluminum sheets. **Eutectic Welding Alloys Co.**

» «

## Midget Gauges

**4** Four models of midget-type gauges have been added to the line of adjustable limit snap gauges manufactured by the **George Scherr Co., Inc.** These are designed for checking and inspecting extremely small and delicate parts. They can be set to handle work from 0.000 to 0.760 in.

**Editor, THE WELDING ENGINEER, 506 So. Wabash Ave., Chicago 5:**
**Please have literature sent to me on the following items:**
**(write in the numbers of those that interest you)**

_____ _____ _____ _____ _____ _____

**Name** ..... **Title** .....

**Company** .....

**Address** .....

**City** ..... **State** .....

**Number of Welding Operators in your plant** .....

**June, 1944**

# For *dependable* deep-groove welds

## *Use* RACO 5 *Electrodes*

RACO 5 Electrodes are outstandingly superior for deep-groove welding, in the flat position, A.C. and D.C., straight polarity, on medium and heavy mild steel plates, especially Class 1 pressure vessels, A.S.M.E. and A.P.I. codes.

The chief features of RACO 5—ease of manipulation, minimum spatter, high physical properties, easily removed slag and smooth contour of deposit—are your positive assurance that RACO 5 meets your demand for the highest quality type E 6030 electrode obtainable.

The exhaustive research, precise control throughout manufacture, and long experience that lie behind all RACO products show up in the splendid performance of these products on the job. Should you wish to test RACO 5, and so convince yourself of their top-flight qualities, we shall be glad to send samples.

**Other Reid-Avery Electrodes for A.C. or D.C. Welding**

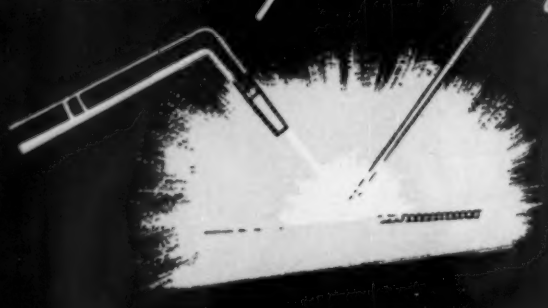
**RACO 6 • RACO 8 • RACO 11 • RACO 20 • RACO 82 • RACO 64**

The REID-AVERY COMPANY

DUNDALK BALTIMORE 22 MARYLAND

# TITAN WELDING RODS

*are Doubly Deoxidized*



*to produce:*

- DUCTILE WELDS
- HIGH STRENGTH WELDS
- DENSE NON-POROUS WELDS

★Wherever oxy-acetylene bronze welds are used . . . for speedy repairs or production work . . . Titan bronze welding alloys give best results because they are doubly deoxidized.

This double deoxidation process, an exclusive development of Titan metallurgists, is a method by which all occluded and dissolved gases picked up in the melting are removed. The removal of these gases prevents the absorption of other gases from the torch, from the atmosphere and from the job itself.

Titan Bronze, Titan Manganese Bronze and Penn Bronze welding rods can all be used with success as general purpose rods. However, best results with cast iron, malleable iron, wrought iron, galvanized iron, steel, brass and bronze, can be assured by specifying those properties in the welding alloys which the weld will require in service.

*Write today for details on how you can benefit by using Titan's doubly deoxidized bronze welding alloys.*

Titan

**METAL MANUFACTURING CO., BELLEFONTE, PA.**

NEW YORK • CHICAGO • SAN FRANCISCO

*Quality Alloys By Brass Specialists*

**Brass and Bronze Rod • Forgings • Die Castings • Welding Rods**


### Soldering Fluxes

**5** Two new fluxes to facilitate soldering are announced by the **Wolfe-Kote Co.** Both are applied with a brush and will clean, remove rust and flux, all at the same time. **"Tri-Flux"** is used for ordinary iron and steel work and **"No. 5 Tri-Flux"** for stainless steel and Monel metal. These fluxes, states manufacturer, can be applied to a wet surface without drying it or to an oily surface without wiping it off. The need for precleaning with an acid or oil solvent is thus eliminated.

» «

***Respirators are more comfortable with these knitted cotton facelets.***

### Respirator Facelets

**6** American Optical Company's R-1000 respirator is now being equipped with knitted cotton "facelets" to make it more comfortable to wear. This respirator was developed to protect workers against certain dust, fume and gas hazards. The facelets are soft against the skin, absorb perspiration and are said also to help prevent skin irritation. They are washable and will fit most respirators of standard design, manufacturer states.

» «

### Aluminum Cleaner

**7** **"Diversey D-C No. 36"** is a new cleansing agent developed in order to meet a number of difficult aluminum cleaning problems, particularly with regard to faster removal of identification inks, to provide free rinsing without white film formation and to eliminate corrosion on formed and heat-treated stock.

The new product was laboratory tested on Alclad 24ST, plain 24ST, 52S½H, 24SO, Alcoa No. 1, 3S, 47A8T, 17ST and 2S. On the basis of the test data, the manufacturer is able to state that the new cleaner does not cause gas or corrosion, that it forms no white film on rinsing in hard water, that it can remove difficult identification ink in 40 seconds and that its water-softening action is excellent. **The Diversey Corp.**

*(Continued on page 77)*

# Costs per Lb and Sq In.

*By* T. B. JEFFERSON

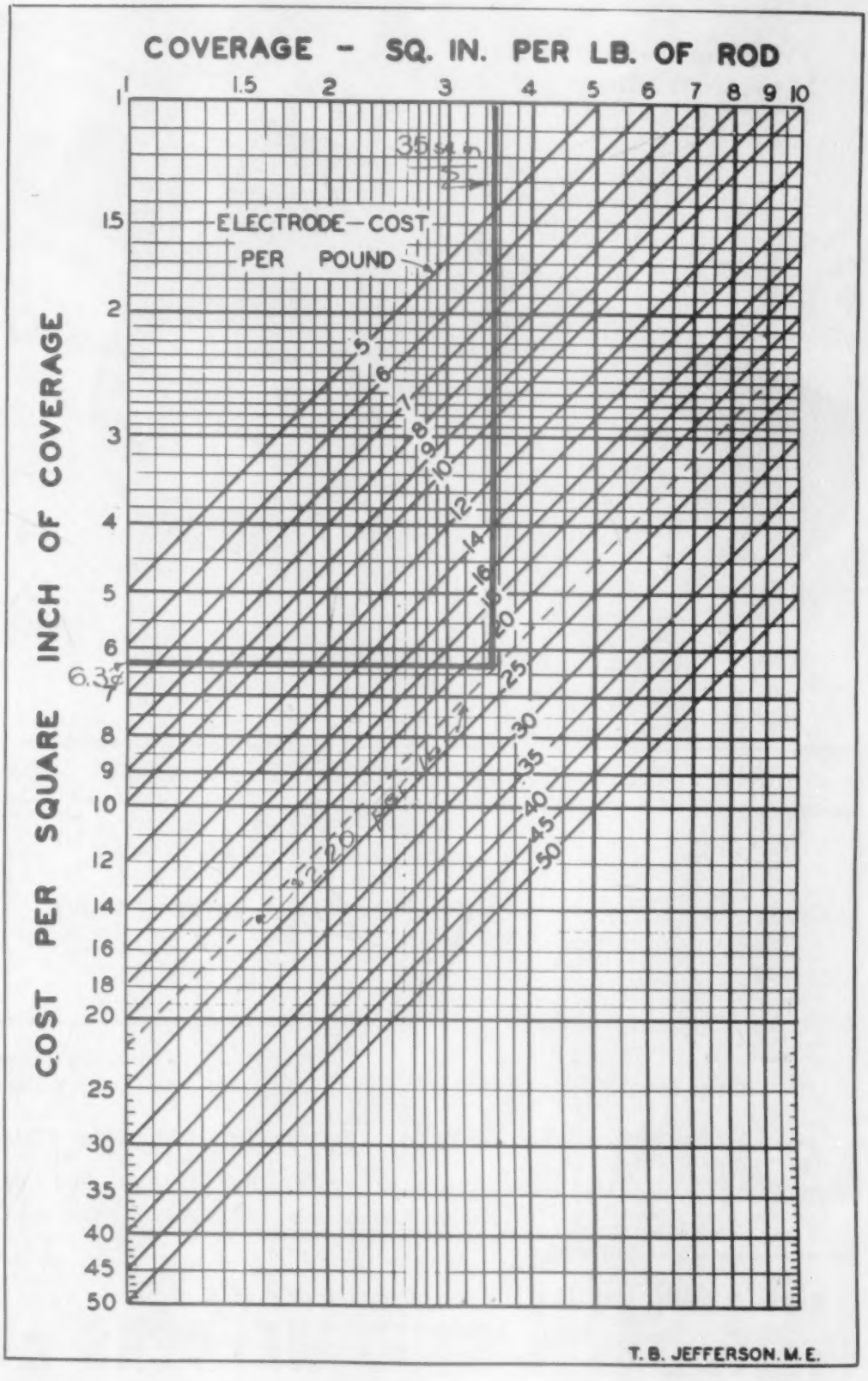
THE COST of the deposited weld metal when overlaying or building up surfaces can be figured by simple arithmetic if the estimator knows the price per lb of the filler metal and the number of sq in. of surface each lb of filler metal will cover. With these figures known, the accompanying logarithmic chart will simplify the job even further by eliminating the arithmetical calculations.

For an example, it is found by research that a lb of hard-facing material when deposited $\frac{1}{8}$ in. thick would cover 35 sq in. This rod cost $2.20 per lb, and it is desired to know the material cost of a deposit covering an area of 10 sq in.

The answer is found as shown by the colored lines on the chart. First, a straight edge is placed so as to form a diagonal line indicating a cost of $2.20 per lb. This is done by connecting 22 on the vertical line at the extreme left with 2.2 on the vertical line at the extreme right. The next step is to locate the point where 35 sq in. (horizontal scale) intersects the new $2.20 cost per lb diagonal. Reading this point on the vertical scale, it will be found that the cost per sq in. of coverage is 6.3c. The cost for a 10 sq in. area is naturally ten times as much or 63c.

If the coverage in sq in. per lb is not known, it may be determined by referring to Data Sheet No. 16*.

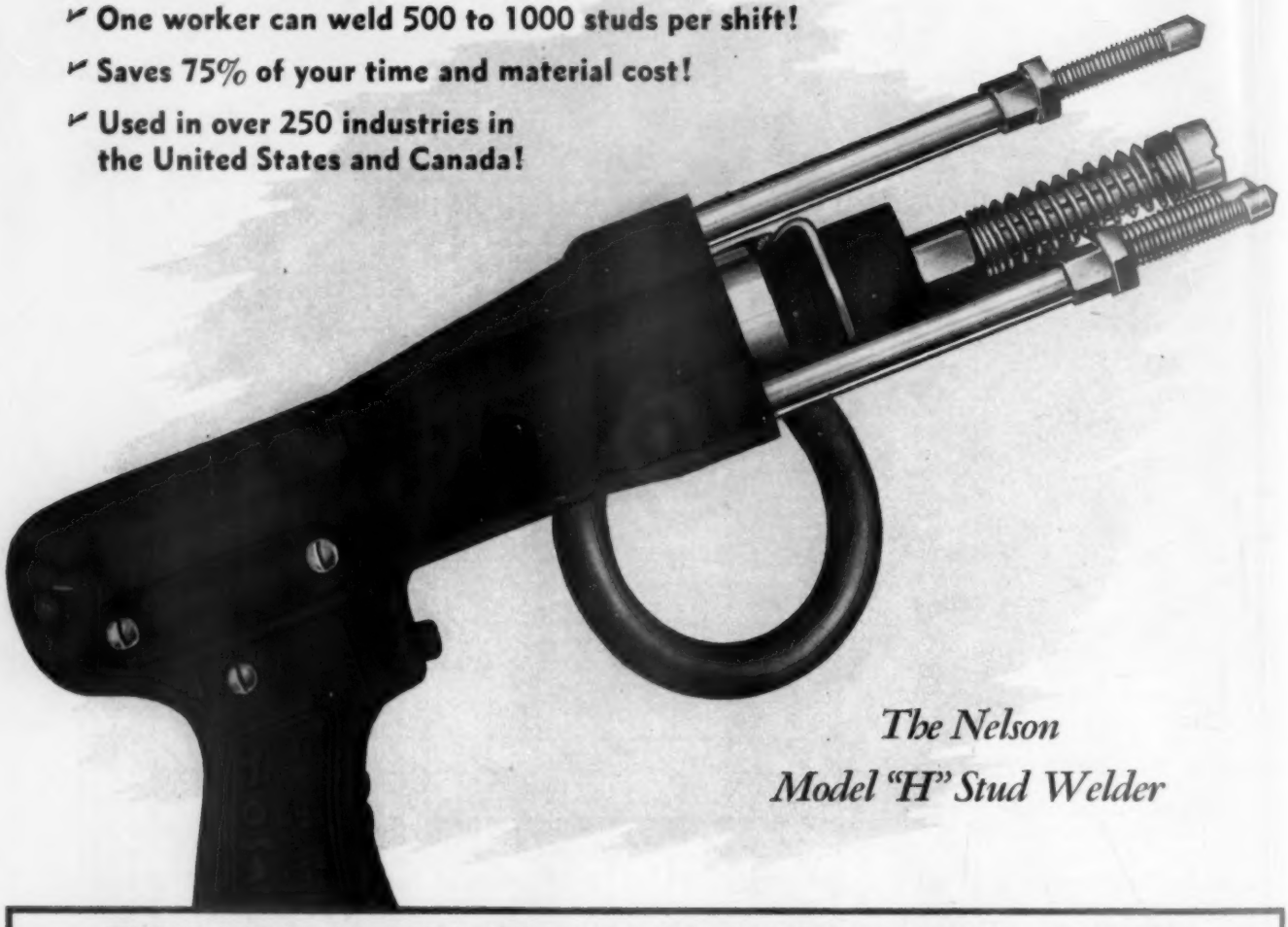
Since the accompanying chart is of a logarithmic type, it will be suitable for materials within any price range or for all areas if care is taken to place the decimal point correctly. For example, in the previous problem, the same diagonal could be used if the material had cost 22c a pound instead of $2.20. In this case, the cost for one sq in. would have been 0.63c—one-tenth the previous cost since the price per lb for the material is only one-tenth as much. The material cost for the 10 sq in. area would therefore be 6.3c.




* See page 57, THE WELDING ENGINEER, January, 1942.

# Here's a short cut to <u>better</u> stud welding!

- Studs automatically welded in less than 1/2 second!
- Easily welds through holes and in difficult locations!
- One worker can weld 500 to 1000 studs per shift!
- Saves 75% of your time and material cost!
- Used in over 250 industries in the United States and Canada!



*The Nelson Model "H" Stud Welder*

## THESE NELSON "FLUX-FILLED" STUDS DO BETTER WORK — FASTER!

**STRAIGHT STUDS**
Threaded or blank in lengths from 1" to 6". In diameters of 1/4" to 1/2".

**SHOULDER STUDS**
7/16" and 1/2" diameter. Shoulder lengths of 1/2" to 7" with threaded extension from 3/4" to 1¼".

**DRIVE-IN STUDS**
Drive-in screw with 1/2" or 1½" head attached used with 5/16" diameter female stud.

**BENT STUDS**
Special studs will be made to your specifications. Excellent for steps, reinforcement, hooks, etc.

**INSULATION PINS**
1½" head insulation pins in lengths of 1" to 6". For securing soft insulation material of all types.

FREE CATALOG and complete information on stud welding sent on request. **Write today to:**

**NELSON SPECIALTY WELDING EQUIPMENT CORP.**
**Dept. W, 440 Peralta Ave., San Leandro, Calif.**
*Eastern Representative — Camden Stud Welding Corp., Camden, N. J.*

# NELSON STUD WELDERS & STUDS

# New Products

*(Continued from page 74)*

### A-C Welder

8 A new "postwar" a-c arc welder has been placed on the market by the **Hampton Electric Mfg. Co.** This machine was designed primarily for

*Hampton portable a-c arc welder. It has a stepless welding range of 20 to 200 amp.*

small machine shops, sheet metal works and garages, but it is suitable for practically any place where welding is done. Its large ball-bearing swivel castors permit it to be readily moved from place to place in the shop.

The new Hampton welder has a continuous welding range of from 20 to 200 amp and will handle electrodes of $\frac{1}{16}$ to $\frac{1}{8}$ in. diameters. It can be operated on either 110 or 220 volts.

» «

### Deoxidizer and Degreaser

9 A new chemical bath, Turco **"Vulco-Etch,"** has been developed to render aluminum surfaces chemically and metallurgically clean in preparation for spot welding. Aluminum alloy surfaces are said to be freed of oxides, corrosive salts and tenacious grease and oil films after a 5 to 20 minute dip in this solution. After cleaning, the aluminum rinses freely in fresh running water, it is stated. **Turco Products, Inc.**

» «

### Grinding Wheels and Shapes

10 A line of "Stermount" wheels and points with detachable spindles has been developed for use with precision or portable equipment on difficult grinding jobs. The wide variety of wheels and shapes offered in this new line permits the successful accomplishment of grinding and polishing in hard-to-get-at locations and "inaccessible" places, states manufacturer. All of the items listed are available with either a vitrified or a resinoid bond. **The Sterling Grinding Wheel Div. of the Cleveland Quarries Co.**


# Two Ways of "*Making It Last*"

Crusher wearing parts are usually made of manganese steel, but even "the toughest steel known" wears down in time. In some cases where grinding wear rather than heavy shocks is the destructive force, it is economical to hard-surface new manganese steel castings. That is one way of "making it last."

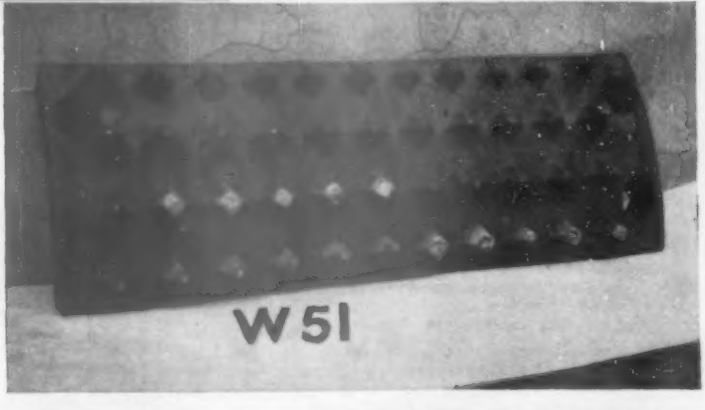
In other cases, where repeated impacts so work-harden the surface that no hard-facing wears longer, the manganese steel part when worn can be economically rebuilt to its original dimensions and the weld metal hard-faced.

W-12 shows two manganese steel pulverizer hammers worn down in crushing rock. The one on the left was built-up with Amsco Nickel Manganese Steel electrodes, after which Economy Hardface was applied to the surface of the weld metal.

W-51 is a roll-crusher segment used in a coal preparation plant. The rebuilding job is in progress on this segment; one of many where worn teeth have been built up repeatedly to their original height with Amsco Nickel Manganese Steel welding rod and then surfaced with Economy Hardface. The Economy cap is hammered to a point while the weld metal is hot.

Economy Hardface is a rolled and cold drawn chromium-molybdenum steel rod which makes sound deposits having a Brinell hardness of 450-550. It is air hardening and gives a surfacing that resists shocks as well as abrasion. It is preferred for many reclamation jobs because it can be built up to depths between ½" and 1" without serious checking or other defects.

Bulletin 941-W covers all Amsco Welding Products.

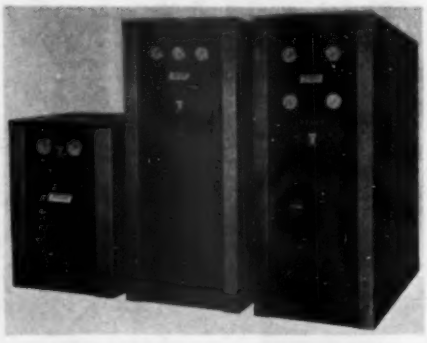



Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

**11** "Frostrode" industrial refrigeration units have been improved and increased in reserve capacity. The line now comprises four standard models: 751, 1501-E, 3002 and 5001, which are designed to maintain a zero to 10 F coolant temperature during continuous production runs of one, two, four and six light aluminum welders, respectively.

Among the improvements is an evaporator coil arrangement that eliminates all sharp bends and so permits an unrestricted flow of the coolant. Improved refrigerant expansion valves have increased the sensitivity to temperature variations; greater ease of inspection and maintenance are provided by the relocating of the thermometer bulb and expansion valve. All of the units are now designed for the use of methyl chloride in order to comply with WPB requests to conserve the supply of Freon refrigerant. **Frostrode Products.**



*Left to right are Models 751, 3002 and 5001 to refrigerate one, four and six spot welders, respectively.*

» «

*AISECO "Coverall" goggles. For those who must wear prescription glasses.*

## Safety Goggles

**12** Designed for those who are compelled to wear prescription glasses, these lightweight, durable goggles will fit over any style of spectacle. They are made with both 50 mm clear hardened lenses for chippers and with 50 mm Federal Specification welding lenses. **American Industrial Safety Equipment Inc.**

» «

*G-R voltage control and arc time totalizer unit. Open-circuit voltage is reduced to under 10 volts during non-welding periods and a complete record of actual working time provided.*

## "Volt-O-Matic" Control

**13** Now available for any a-c welder, the G-R "Volt-O-Matic" control safeguards the weldor by reducing open-circuit voltage in the welding leads to less than 10 volts during non-welding periods. Because of this extremely low voltage, operators can change electrodes without a "sting," even when welding in the rain or on wet metal decks, states manufacturer.

An arc time totalizer is included in the unit to provide "production control." This records the actual welding time in hours and tenths of hours, enabling the causes of idle welding machines and lost welding time to be spotted and corrected.

In operation, a low-voltage pilot circuit, closed when the operator strikes the arc, actuates a heavy-duty contactor which closes the power supply circuit, providing full welding current. When the operator breaks the arc, the primary contactor disconnects after a brief delay, and voltage in the welding circuit then drops to less than ten volts. **Glenn-Roberts Company.**

## New Air Tool Drives "blind" Rivets Accurately... Automatically

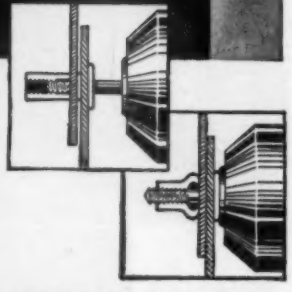
**Installing** "blind" RIVNUTS quickly with precise, positive upset while working entirely from one side is now possible with the recently developed Auto RIV-Driver. Completely automatic, the tool runs a threaded mandrel into a Rivnut, upsets it, backs the mandrel out and stops the tool. Operators simply press a throttle; make no manual adjustments for any operation. Rivnuts are installed 6 to 8 times faster than formerly; rejects are almost completely eliminated.

**The** tool can be adjusted to upset at any depth required. Once set, adjustment is tamper-proof—every Rivnut is driven accurately and uniformly. An indicator on the tool handle lights when the upset is correct; does not light if Rivnut is improperly headed.

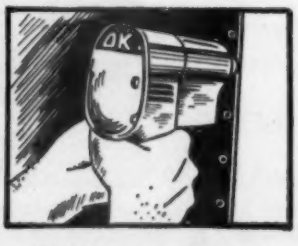
**Powered** by compressed air, the Auto RIV-Driver weighs just 4¼ pounds; is 9½ inches long; balanced for efficient handling by women operators.

**You** all know that our fighting men need the finest quality materials that we here at home can produce. That goes for Wrigley's Spearmint, Doublemint and "Juicy Fruit" chewing gum, too. Our stock pile of raw materials that goes into the making of Quality chewing gum is getting lower and lower. Until we can again build up our raw material inventory, we are sending all of our limited output of Quality chewing gum to our fighting men and women overseas, only.

*You can get complete information from the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago 6, Ill.*



**Rivnuts (mfd. by B. F. Goodrich Co.) are internally-threaded tubular rivets which can be installed "blind" while working entirely from one side of the job.**

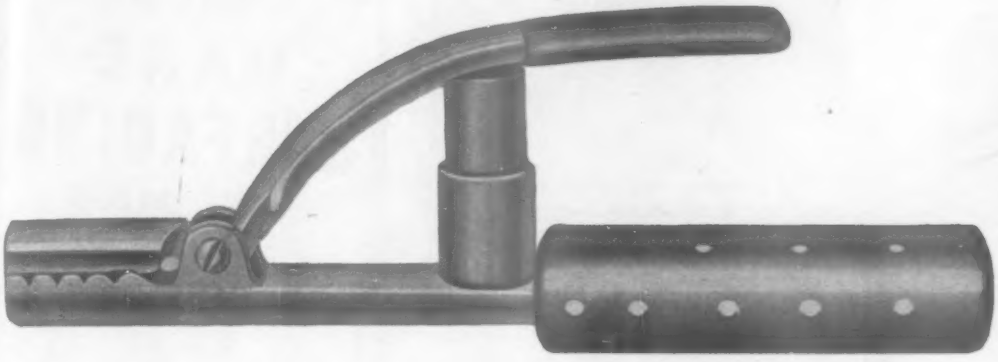



**Automatic action, positive depth control and visual indicator assure correct and uniform installation of rivnuts with new Auto RIV-Driver**

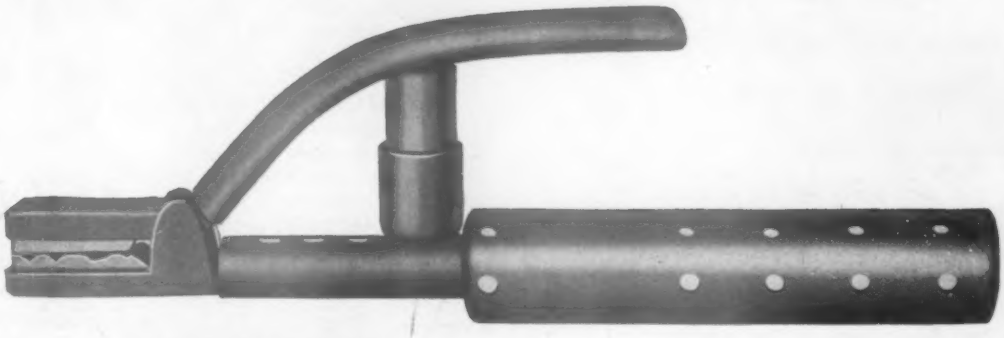
Y-117

# THERM-ARC ELECTRODE HOLDERS

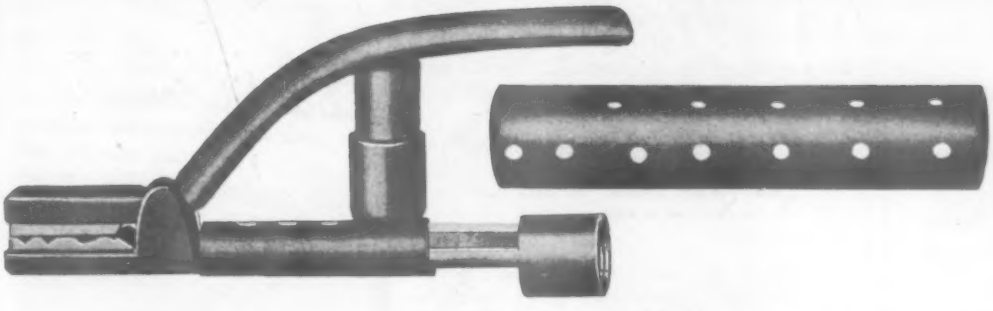
## A Type of Holder that has Proven Itself
## The only fully-insulated coil spring holder



**TYPE N**
**Partially Insulated**



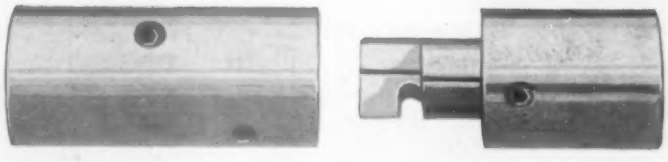
**TYPE K**
**Completely Insulated**



**TYPE M**
**Detachable Completely Insulated With Removable Front**

# THERM-ARC CABLE CONNECTOR

**This unit can be connected or disconnected quickly by a very short turn. The action is instantaneous and a tight, contacting connection is assured throughout entire circumference of male plug; no possibility of loosening while in use.**



*Write for our attractive, illustrated, descriptive booklet of THERMEX Holders and Cable Connectors.*

# THERMEX EQUIPMENT COMPANY

**2045 Celia St.** **Tel. TYler 7-1337**

**DETROIT 8, MICH.**

# "GENERAL" WELDING FUME EXHAUSTERS

For effective elimination of the *Noxious Fumes* from

**Arc Welding**

**Galvanized Iron Soldering**

**Spray Painting, Etc.**

**TWO TO TEN INLETS—**

For multiple hose connections in shop and field operations.

**SINGLE INLET UNITS—**

For exhaust from booth collector ducts; and in the smaller units.

---

**High Velocity Exhaustion by High Speed Centrifugal Fans for Small, Easily Handled Hoses**

---

**SEMI-PORTABLES—**

Movable by crane hook or carrying bar; or for fixed (duct) service. ¾ to 15 motor horsepower.

**PORTABLE "JUNIORS"—**

40 to 100 pounds in weight; one or two inlet nozzles.

Self-closing caps on all nozzles.
Rugged, all-steel construction.
Motored for continuous service.
Controls protected within base.

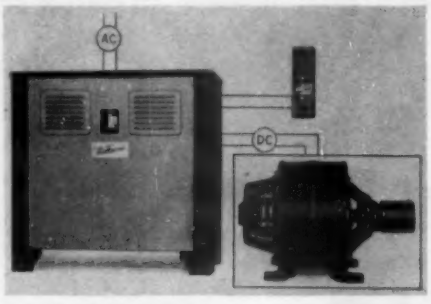
*Bulletin CB-103 gives specifications and dimensions for the 28 types and sizes comprising the "General" line.*

**GENERAL BLOWER CO.**

403 N. Peoria St., MONroe 0244
New York CHICAGO 22, ILL. Detroit
Pittsburgh Philadelphia Cleveland


### Electronic Motor Drives

**14** A line of adjustable-speed electronic motor drives to enable d-c motors to be driven from a-c power is being introduced by the **Weltronic Co.**




*The new Weltronic drive control enables a d-c shunt motor to be operated from an a-c power source. The unit pictured has a capacity of 3 hp.*

These self-contained "package" units are applicable to any machine driven by a d-c shunt motor. Electronic rectifier tubes are employed to convert alternating to direct current supplying separate power to the d-c motor armature and field circuits. Each circuit is individually controlled through other electronic tubes to provide speed adjustment and current regulation. Units may be wall- or floor-mounted at any convenient location. Capacities range from ½ to 3 hp, single phase, and 5 to 10 hp, three phase. Standard voltages are 220/440 at 60 cycles.

» «

### Ratchet Wrench

**15** This ratchet wrench is a pneumatically operated tool for difficult nut-runing in close quarters. It can be

*Keller ratchet wrench. Its nose can be inserted in tight quarters.*

turned over and used in this position to unscrew nuts, in addition to its normal function of tightening. The wrench is available in three sizes with sockets ranging from ¼ to ¾ in. **Keller Tool Co.**

» «

### Fire Extinguisher

**16** Designed especially for industrial fires of either flammable-liquid or electrical origin, the new 37 lb "All-Out" extinguisher ejects a stream of dry chemical which, when activated by heat, forms a dense, fire-smothering cloud over a flaming area up to 18 ft. The chemical, states manufacturer, is a nonconductor of electricity and is harmless to the delicate parts of motors or machinery. The cloud it creates forms a heat-deflecting screen between the operator and the flame, permitting a close-range attack of the fire. **National Powder Extinguisher Corp.**


# Solve YOUR HARD SURFACING WELDING PROBLEMS • AGILE ELECTRODES

**Violet** . . is unusually adaptable for building up surfaces that require high resistance to abrasion and impact. No brittleness of weld metal — Gives a uniformly flat deposit with no trace of porosity.

**Dark Green** . . will solve 90% of your hard surfacing problems. It can also be used in the forming of dies. It also produces a very hard weld, free from porosity.

**Pink** . . is usually easy to apply and very economical to use. The slag is porous and light and can be easily removed with a wire brush. The weld deposit insures long wearing qualities.

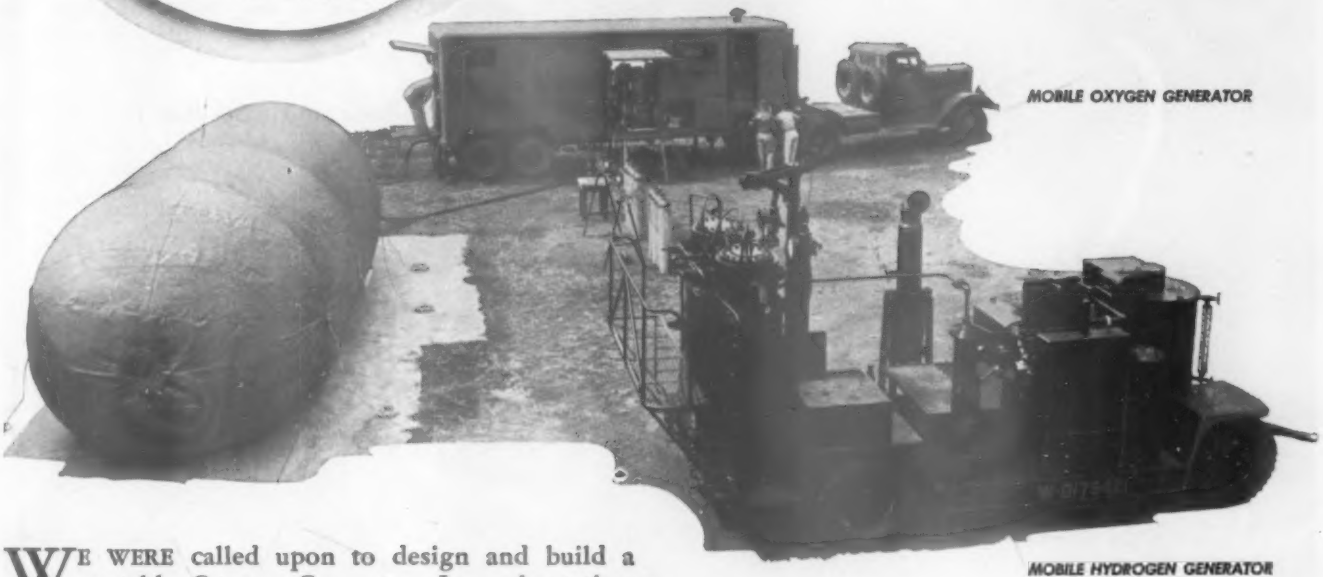
**AMERICAN AGILE CORPORATION**

5806 HOUGH AVENUE
CLEVELAND 3, OHIO

AGILE ACTARC

ARMY
E
NAVY
"... This is your nation's tribute to your patriotism and to your great work in backing up our soldiers on the fighting front."
Under Secretary of War

# Serving the Armed Forces



MOBILE OXYGEN GENERATOR

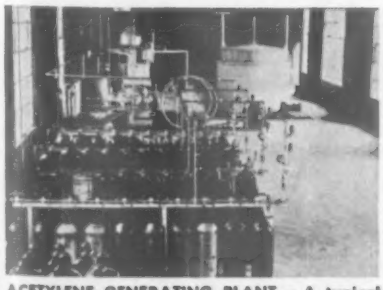
MOBILE HYDROGEN GENERATOR

WE WERE called upon to design and build a portable Oxygen Generator. In a short time Independent Engineers completed the first Mobile Oxygen Generator capable of producing 99.5% pure oxygen and charging high pressure oxygen cylinders in the field.

There are now many of these Mobile Oxygen Generators supplying oxygen to our Armed Forces in all theaters of this war.

WE WERE also called upon to design and build a portable high pressure Hydrogen Generator. This was the first portable high pressure Hydrogen Generator capable of producing hydrogen and charging high pressure cylinders in the field.

**OXYGEN GENERATOR**—This is a view of a typical commercial Oxygen Generator installation in operation. This plant produces 750 cubic feet per hour and up of 99.5% pure oxygen.



**ACETYLENE GENERATING PLANT**—A typical installation of our continuous generator and charging plant.

## After Victory....

We will be building Oxygen and Hydrogen Plants for commercial users; also, Acetylene Generating Plants, High and Low Pressure Cylinder Testing Equipment, Acetylene Cylinders, etc.

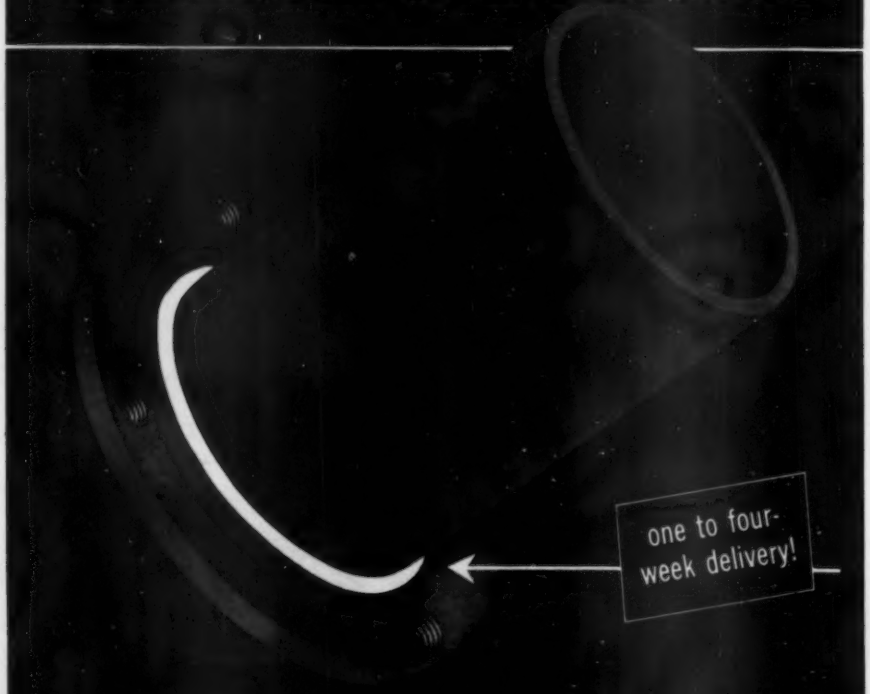
We will be glad to go over your requirements and assist you in any way possible. If you are directly or indirectly serving the Armed Forces, it may be possible to obtain this equipment now. Address your inquiries to Sales Engineer, Department W.E.

**INDEPENDENT ENGINEERING CO.**
INCORPORATED
O'FALLON ILLINOIS

**HYDROGEN GENERATOR**—This is our compact Single Generator, High Pressure Hydrogen Plant. This generator produces 2500 cubic feet per hour of Hydrogen at 2500 lbs. pressure and charges cylinders direct.

**TESTING EQUIPMENT**—A typical installation for testing between 40 to 50 cylinders per hour in our testing department.

# NU-Braze easier-working silver alloys for speedy metal-joining




- Conform to every individual government and A.S.T.M. specification.
- Processed to improve working qualities.
- Available in bar, wire, helical or ring form; or special shapes to speed production.
- Saves man-hours–frees vital machine tools for other work.

**Most joints stronger than metals joined.**

***CLIP THE COUPON FOR TEST SAMPLES of these two most commonly-used types:***

**To join copper, brass, bronze:**
**NU-BRAZE GRADE III**—1300° F. silver-phosphorus brazing alloy with unique silver color that shows up against work—speeds production, minimizes rejects. Multiple-annealed to eliminate brittleness and permit easy winding and shaping.

**To join like or unlike ferrous or non-ferrous metals and alloys:**
**NU-BRAZE GRADE VI**—easy-flowing silver-brazing alloy liquefies completely at 1175° F. yet gives thorough wetting action with resultant high capillary creep.

Please forward at once, test samples of your
NU-BRAZE GRADE III ☐ NU-BRAZE GRADE VI ☐

NAME_____ POSITION_____

COMPANY_____

ADDRESS_____

CITY & P. O. ZONE_____ STATE_____

**SHERMAN & CO.** 197 CANAL ST., NEW YORK 13, N. Y.


### Multicontact Timer

**17** The **R. W. Cramer Co.** has just placed on the market a new multicontact timer for remote control. This device may be used to control a series of machine operations in definite order, to operate a series of signals, valves or solenoids in a predetermined sequence and for other applications where sequence operations are necessary. The solenoid-starting mechanism is operated from a remote control momentary start button. In stopping, the timer will go through its complete cycle or through any part of its cycle of operations. Reclosing of the start button will either continue the cycle or repeat it from the beginning.

» «

### Mask and Acid Hood

**18** The new "StaSafe" hood completely covers the head and neck, giving protection from the shoulders up against

***"StaSafe" acid hood. It adjusts to wearer's head size and allows room for safety goggles.***

a spray, splash or shower of acid. Hood is made of flameproof fabric that is said to be resistant to acids, solvents, lacquers, oils, greases, etc. The transparent shield is of acetate plastic. **Standard Safety Equipment Co.**

» «

### Salt Tablet Dispensers

**19** The "Fairway" plastic salt tablet dispenser has a transparent window to permit the supply of tablets to be easily checked. It is made in two sizes: 1,500 and 350 tablet capacity. The smaller size is for use near drinking fountains which serve approximately 20 people or less; the larger size should be used in areas of heavier traffic. Tablets of either salt or combination salt and dextrose are available in suitable packages for the dispensers. **Standard Safety Equipment Co.**

---

***For More Information***

**Use Coupon on Page 72** to secure further information on any item in the New Products section.

# *How come* he's checking up on welds?

THERE'S a simple reason. Repair a broken casting by bronze welding . . . and the quality of the weld metal is of vital interest to the man who machines the part to its final dimensions.

The machinist is only *one* of the many new men whose requirements may influence your welding practices. Chemists, safety experts, electrical engineers . . . they all may have a hand in setting the complex standards by which your weldments must be approved.

It may be worth-while to re-examine your welding rod selections and techniques in the light of these new requirements. If you want the advice of men who know bronze welding procedures from every service standpoint, just call the nearest Chase Sales Service Office. They are ready to help you with your welding problems—or to get the answers for you from Chase headquarters.

CHASE

**CHASE BRASS & COPPER CO.**

—Incorporated—

*Waterbury, Connecticut*

A SUBSIDIARY OF KENNECOTT COPPER CORPORATION

ALBANY† ATLANTA† BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON INDIANAPOLIS† KANSAS CITY, MO.† LOS ANGELES MILWAUKEE

MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WASHINGTON†

† *Indicates Sales Office Only*

*This is the Chase Network—handiest way to buy brass*

# News of the Industry

## No Travel Time to Weldors—WLB

The payment of travel time to weldors supplied by subcontractors to shipyards in the New York area can be made only if the yards' regular employees are compensated for time spent in getting to work, the National War Labor Board ruled on April 18.

In this decision, the Board upheld a ruling of the WLB Shipbuilding Commission and denied an appeal by the Welding Contractors Association of New York, an organization composed of companies maintaining a mobile pool of some 2,500 weldors for emergency shipyard work. The association had asked for permission to establish a uniform rate of $1.20 per hour with additional pay of one hour per day for travel time.

» «

## B. F. McDonald Co. Moves to New Home

The B. F. McDonald Co., Los Angeles manufacturer of safety devices, is now located in a new building occupying an entire block on South Hoover St. between 51st and 52nd. The building provides nearly 30,000 sq ft of floor space, permitting the company for the first time to consolidate its assembly and production facilities under one roof.

The McDonald Co. manufactures a number of specialized safety devices including an aluminum-alloy head protector, a respirator, a plastic eye protector and a lens widely used in protective goggles by aluminum weldors. The firm also distributes a complete line of other safety equipment such as clothing, first aid materials, gas masks, etc. In addition to the Los Angeles headquarters, sales and service offices are maintained in San Francisco and Houston, Tex.

» «

## Bastian-Blessing Wins Second Army-Navy "E"

Employees of the Bastian-Blessing Co., Chicago, have won for the second time the Army-Navy Production Award for meritorious service on the production front. In conferring the award, Under Secretary of War Patterson said: "You have continued to maintain the high standard you set for yourselves and which won you distinction."

» «

## Colonial Co., Boston, Changes Its Firm Name

The Patent Fabric Co. is the name which is succeeding that of the Colonial Co., 195-201 South St., Boston 11, manufacturer of black and colored patent fabric for bags and shoes. The change does not affect the Colonial Tanning Co., Inc., Boston 11, and its glove and garment leather division in Milwaukee, which supplies leather for men and women weldor's gloves and garments.

» «

## Emerson Electric Wins Its Second White Star

Acknowledging the important contribution to victory being made by the power-operated airplane gun turret, Under Secretary of War Robert P. Patterson wrote to inform employees of the Emerson Electric Manufacturing Co.'s electrical and turret divisions that a second white star could be added to their Army-Navy Production Award flag.

The turret plant held an open house on a recent Sunday under auspices of the company's Labor-Management Committee. Several thousand visitors attended. During the inspection tour, they saw sheet metal parts being spot welded and heavier parts being arc and gas welded into assemblies for Emerson gun turrets.


Ask for CMD WELDERS' CHIPPING HAMMERS

A type for every weld cleaning need. Cutting edges stay sharp a long time. Write Department 4W for descriptive circular now!

**TYPE CB**
**Triple Duty**
Combines 3 tools in 1—drift, chisel, and removable wire brush.

**TYPE A**
**Drift and Chisel**
Made from high-grade tool steel. Especially popular in malleable iron and grey iron foundries for general chipping.

**TYPE C**
**Drift and Chisel**
Same as Type CB but without brush.

CHICAGO MANUFACTURING AND DISTRIBUTING COMPANY
1928 WEST 46th ST., DEPT. W., CHICAGO 9, ILLINOIS

# Specify "NORTON RESINOID" for Your Weld Grinding Wheels

YOU need fast cutting action to quickly remove the excess metal at the weld—you need a smooth surface for the subsequent finishing operations. Norton Grinding Wheels have been scientifically developed in the right grains and grades for all kinds of weld grinding.

**STRAIGHT WHEELS**—Usually 6" or 8" diameter and from ¼" to 2" thick. For the thinner wheels 20 grain and a coarser grit—24—for the thicker wheels. The most common hardness is P4T or Q4T-H Alundum resinoid for carbon and alloy steels.

**CUP WHEELS**—Probably the most popular sizes, are flaring cups (6-4½") x 2" x ⅝" with a 1" rim and straight cups 6" x 1½" x ⅝" with a 2" rim. They are available with ⅝" holes or mounted on ⅝" threaded steel bushings. For general work, the wheel specification is usually 16 or 20 grit, grade P4T Alundum resinoid.

**CONE WHEELS**—Cone wheels are mostly used for grinding welds in holes and other hard-to-get-at places. One of the most common sizes is 2¾" x 3½" with ⅝" threaded hole, 24 grit Q4T-L Alundum resinoid.

**NORTON COMPANY**
**Worcester 6, Mass.**

A Four-Star Army-Navy "E" flies over the Norton Plants at Worcester

**NORTON ABRASIVES**

### First New LSM Ship Launched at Pullman

The first of a new-type landing ship, the "LSM" (Landing Ship—Medium), was launched on April 29 at the yards of the Pullman-Standard Car Mfg. Co., Chicago. More than 200 feet long, the new vessel is the final and most restricted of the eleven basic designs of landing craft deemed necessary by the Navy for coming amphibious operations. According to Commander Paul S. Goen, U. S. N. (Ret.) supervisor of shipbuilding, Chicago, who represented the Navy at the launching ceremony, the LSM is "a full sea-going type which can go anywhere by itself and have more speed than contemporary landing craft."

### Marinship Leads Nation in Tanker Productivity

Undefeated for the second consecutive month, Marinship Corp., Sausalito, Calif., continues to fly the national Tanker Champ flag for its performance in delivering tankers to the U. S. Maritime Commission. Three completed tankers were delivered in April and a goal of four ships set for delivery in May.

The tanker S. S. *Mission Capistrano* was launched on Marinship Family Day, May 7, in the presence of 15,000 workers, guests and their respective families. This was the 43rd ship to be launched at the Marin County shipyard since its construction was started 25 months ago and the 19th tanker to be named for a California mission. The mission tankers are reported to be the fastest commercial tankers yet built.

» «

### White Metal Rods Now Priority Free

White metal welding rods, which previously required an AA-5 or better priority, may now be purchased without priority for repair work, reports R. H. Ogden, president, Aladdin Rod & Flux Mfg. Co., Grand Rapids, Mich. This is in accordance with the War Production Board's recent No. M-11-b ruling.


EDCO Center Grip

PHOSPHOR BRONZE

ELECTRODES

★ FOR ALL TYPES OF BRONZE ARC WELDING, USED EXTENSIVELY BY:

Railroads, Refineries, Shipyards, Chemical Industries, Utilities, Welderies and Manufacturing Plants, for fabricating or building up worn bronze propellers, condenser tubes, valves, etc. Welding tool steel, bronze or copper fittings, supports, etc. to steel. Recommended for applying an overlay on steel to provide a non-seizing surface.

YOU'LL FIND THAT YELLOW SHIELDED EDCO *CENTER GRIP* GIVES YOU MORE WELD PER POUND, LESS WASTE PER STICK AND GREATER CONTROL

(★ Write or wire for your nearest Distributor.)

*SOLE MANUFACTURER*

ECCLES & DAVIES MACHINERY CO., INC.

1910 SANTA FE AVENUE • LOS ANGELES 21, CALIFORNIA

Phone Trinity 2131

*Distributors in All Principal Cities*


## ABOUT PEOPLE

**Clyde A. Crowley,** consulting engineer, and **Royal L. Stapleton,** management engineer and consultant, have joined together to organize the firm of Crowley, Stapleton & Associates, Inc. Laboratory, library and general office will be maintained at 407 S. Dearborn St., Chicago 5.

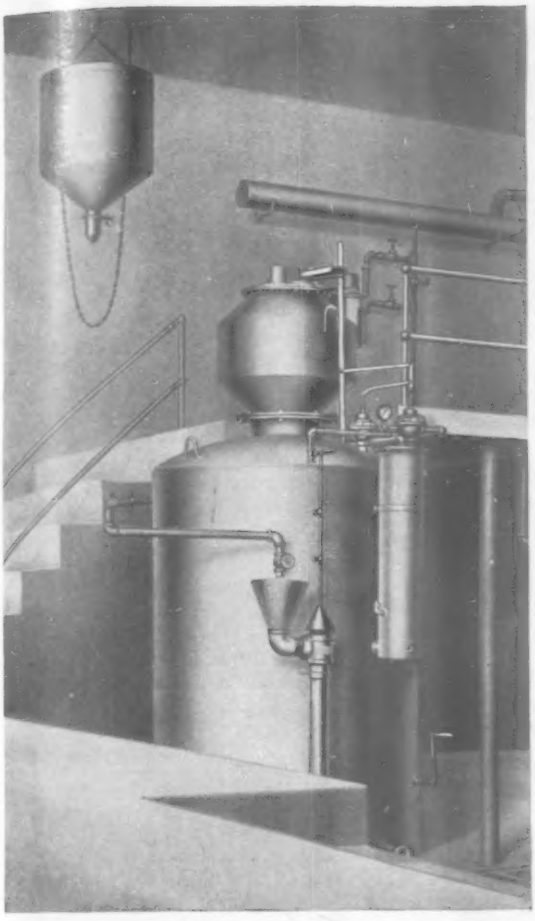
» «

**John P. Dods,** director of research and advertising manager for the Summerill Tubing Co., Bridgeport, Pa., has been appointed director of advertising and sales promotion for the closely affiliated interests of The Columbia Steel and Shafting Co., The Edgar T. Ward's Sons Co. and the Summerill Tubing Co. Mr. Dods will handle advertising, technical literature and other promotional activities of the three companies, with offices in the Norristown Penn Trust Building, Norristown, Pa.

### Welded Invasion Barges

*Courtesy, The Lincoln Electric Co.*

***Even as this is being written, the Yanks may be landing in France (or Holland, Denmark, Norway, Belgium or what have you). These weldors at the Brown Steel Tank Co., Minneapolis, are doing their bit to forward the invasion timetable: the big steel structures will soon form complete landing barges.***



# What Size, Please?

● Little or big, portable or stationary, Sight Feed has just the Acetylene Generator to fit *your* welding needs. Five portable models range in capacity from 6 to 100 pounds of carbide per charge—generating 30 to 500 cubic feet of purer, hotter acetylene gas. Five stationary models hold from 125 to 600 pounds of carbide, and will give you 595 to 2840 feet of acetylene without refill. So, just let us know *which size* Sight Feed will best serve your particular requirements, and we'll make delivery promptly. Or if you wish more detailed specifications, just say the word and we'll send 'em by return mail.

**THE *Sight Feed***
**GENERATOR COMPANY**
SALES: RICHMOND, INDIANA • FACTORY: W. ALEXANDRIA, OHIO

---

## Save Time While Reloading!

## How TO SPEED UP WELDING OPERATIONS!

## Use This Dual Automatic Welding Fixture!

Automatic Welding-head Positioner — adaptable to your own holding fixture.

THIS Acme dual fixture arrangement permits practically constant use of an automatic welding head, because one of the fixtures can be reloaded while the other is engaged in the welding operation.

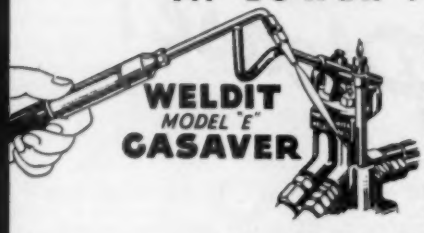
The holding machine can be set to revolve at any angle from vertical to horizontal. (Illustration shows a wheel being welded at 45° angle.) Positioner arm swings from one fixture to the other, locking in proper position. Speed of rotating the work is adjustable, as desired.

**WRITE**
for information relating to your particular welding fixture problem

**ACME *Manufacturing Co.***
1642 HOWARD ST. • DETROIT, MICH.

# Safe Welding

## AT LOWER PRODUCTION COSTS




The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as *fifty* per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . *No readjusting required.* . . . Price $10.00 at Detroit. Order today.

### Better Soldering, Annealing and Heating Jobs

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

**WELDIT ACETYLENE CO.**
628 BAGLEY AVENUE · DETROIT 26, MICH.

# Off the Floor Deliveries!
## ON TRINDL SUPER INDUSTRIAL ARC WELDER
DESIGNED FOR HIGH SPEED PRODUCTION ARC WELDING

**TRINDL SUPER INDUSTRIAL ARC WELDERS, the result of many years of careful engineering and "job tested" research, are rolling up impressive production records. Acclaimed for superior performance, ruggedness, dependability, and economical operation.**

**For better, faster welding, easy-to-operate TRINDL SUPER INDUSTRIAL ARC WELDERS will help step up your production schedules 20% to 40%. Manufactured in a range of distinctive sizes to accommodate every type of shop and production welding job.**

**Trindl Welders, Electrodes, supplies and accessories, available for immediate delivery, will save you both time and money. Write, wire or phone for full details.**

**TRINDL PRODUCTS, LTD.** 17 EAST 23rd STREET AR CHICAGO 16, ILL.


**Allen W. Gordon** has been appointed executive secretary of the Welding Distributor's Association. Mr. Gordon has been field representative for the National Association of Manufacturers during the past six years, covering several southwestern states. His address and that of the Welding Distributors Association will be: 494 Arcade Bldg., St. Louis 1.

» «

**Jack E. Gould** has been appointed general superintendent of the Gary, Ind., plant of Tubular Alloy Steel Corp. Mr. Gould began his service with United States Steel Corp. subsidiaries in 1930 as junior metallurgist at the Lorain Works of National Tube Co. and served in various capacities with this company until his present appointment.

» «

**Fred H. Haggerson,** vice-president and director, was elected president of Union Carbide and Carbon Corp. to succeed **Benjamin O'Shea.** Mr. Haggerson has been associated with the corporation for 25 years. Mr. O'Shea, who has been president since 1941, now becomes chairman of the board.

» «

**Ralph R. Browning, Paul P. Huffard** and **Homer A. Holt** have been elected to the board of directors of Union Carbide and Carbon Corp. Mr. Browning and Mr. Huffard are vice-presidents of this company; Mr. Holt is a Charleston, West Va., attorney and the former governor of his state.

» «

**Earl R. Sayre,** formerly with the Arrow-Hart and Hegeman Electric Co., has joined P. R. Mallory & Co., Inc., Indianapolis, as an application engineer for the company's line of electrical, electronic and metallurgical products.

» «

**John W. White** has been elected president and general manager of the Westinghouse Electric International Co., a subsidiary of Westinghouse Electric and Mfg. Co. He was formerly vice-president and general manager.

» «

**R. A. Neal, J. K. B. Hare, John H. Ashbaugh** and **H. H. Rogge** have been elected vice-presidents of the Westinghouse Electric and Mfg. Co Mr. Neal is manager of the switchgear division, East Pittsburgh; Mr. Hare manager of the central district sales activities, Pittsburgh; Mr. Ashbaugh, manager of the electric appliance division, Mansfield, O., and Mr. Rogge, manager of the company's Washington, D. C., office.

» «

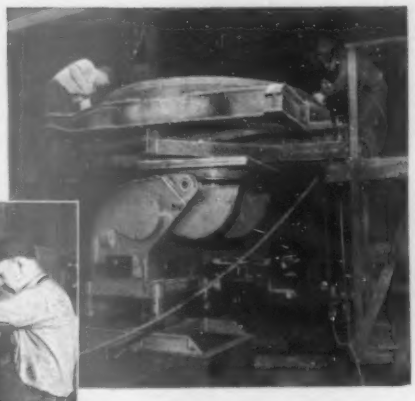
**Dr. J. T. Rettaliata** has been appointed manager of a new research and gas turbine development division recently established by Allis-Chalmers, Milwaukee. He is assisted by **J. L. Ray** as chief engineer in gas turbine development.

# Ransome WELDING POSITIONERS are VERSATILE SHOP TOOLS

If, in your manufacturing processes, your product must be turned or tilted for accessibility, consider the use of Ransome Welding Positioners . . . for easier handling, faster production, better quality work, and reduced worker fatigue.

CHIPPING AND GRINDING

By quickly positioning work, a better and faster grinding or chipping job can be accomplished.



DRILLING

Work can be positioned for drilling at different angles by simply tilting or turning the positioner table top.

*Hard surfacing, assembly, repair or overhauling of intricate units, flame hardening and flame cutting, spot welding castings, are other Ransome applications.*

INDUSTRIAL DIVISION Ransome MACHINERY COMPANY
DUNELLEN, NEW JERSEY
SUBSIDIARY OF WORTHINGTON PUMP AND MACHINERY CORPORATION

# DALLETT
## PNEUMATIC WELD-FLUX SCALING HAMMERS

**Especially designed for roughing, peening, removing flux and excess metal resulting from welding operations.**

- **made in several sizes**
- **button or lever type throttle**
- **safety chisel retainer**
- **smooth in operation**
- **light in weight**

**write for Bulletin No. 500**

## THE DALLETT COMPANY

MASCHER AT LIPPINCOTT STREET — PHILADELPHIA 33, PENNSYLVANIA

Distributed in Canada by G. D. PETERS & CO. OF CANADA, Ltd., 1021 New Birks Bldg., Montreal

*PNEUMATIC AND HAND CHISELS ■ "DALBO" AIR HOSE COUPLINGS*

*"DALLETT" PNEUMATIC SAFETY RETAINER SHANK CHISELS*

■ ■ *"DALWELD" DETACHABLE WELDING CABLE CONNECTORS* ■ ■

**Allen Aikens,** formerly sales manager of the Dockson Corporation's western division, has been made general sales manager of this concern. He has been with Dockson since 1932, prior to which he was connected with Linde Air Products Co.

» «

**Harold B. Ressler,** vice-president of Joseph T. Ryerson & Son., Inc., has moved from Jersey City to Chicago, where he will be in general charge of sales in all territories. **Harry W. Treleaven,** formerly assistant manager, succeeds Mr. Ressler as manager of the Ryerson New York plant.

**Thomas Gallagher,** assistant treasurer and manager of Handy & Harman of Canada, Ltd., was recently elected to the board of directors. Other directors of the Canadian associate of Handy & Harman are: C. W. Handy, G. H. Niemeyer, R. H. Leach, H. W. Boynton, J. C. Travis and J. W. Colgan.

» «

**Ainslie Y. Sawyer,** assistant to the president of Joseph T. Ryerson & Son, Inc., has been elected a vice-president and will continue at Chicago in general charge of purchases. He recently served with WPB as deputy chief of the Warehouse Steel Branch. **Thomas Z. Hayward,** formerly in charge of tubing sales and priorities, has been appointed assistant general manager of sales.

» «

**Arthur J. Miller** was recently elected president and general manager of the Chicago Wheel & Manufacturing Co. to replace his father, the late Henry E. Miller, the founder of the company. Associated with Mr. Miller will be: **Irving Danielson,** vice-president in charge of purchases; **A. J. Miller, Jr.,** treasurer in charge of engineering developments; **Arthur T. Dalton,** secretary and sales manager.

» «

**Lorenzo Kennon,** consulting engineer of Toledo, O., has opened Pacific Coast offices at 1927 Evergreen St., Burbank, Calif. He specializes in mechanical and welding engineering.

» «

**F. H. Frankland** has resigned as director of engineering for the American Institute of Steel Construction in order to open a consulting engineering office at 271 Madison Ave., New York City. His engineering experience includes the design of important bridges, buildings and skyscrapers in the United States and South America.

» «

**W. O. Everling** has been appointed director of research of the American Steel & Wire Co., U. S. Steel subsidiary, succeeding **J. S. Richards,** deceased. **R. H. Barnes** has been named assistant director of research to replace Mr. Everling.

» «

**Edgar C. Thomas,** recently honorably discharged from the U. S. Army with the rank of major, has been elected vice-president of Thomas Machine Mfg. Co., Pittsburgh. Prior to the war, Mr. Thomas had had charge of the Chicago office of the company, which was founded by his father, George P. Thomas. As vice-president, he will direct sales, working through both the Pittsburgh and Philadelphia offices.

» «

**John M. Smith** has resigned as general manager of manufacturing for the RCA-Victor Division of Radio Corp. of America in order to join P. R. Mallory & Co., Inc., Indianapolis, as vice-president in charge of manufacturing.

» «

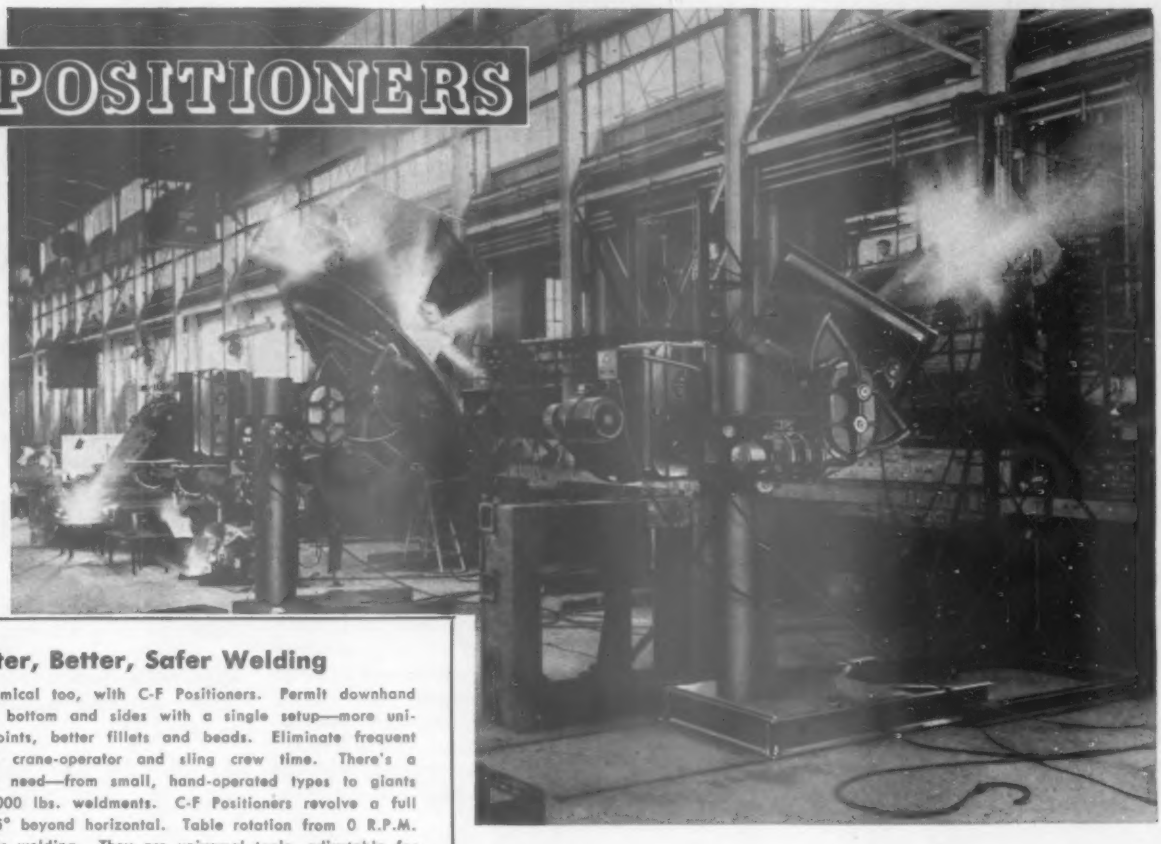
**Edward F. Whittemore,** formerly associated with C. R. Daniels, Inc., New York City, has been appointed purchasing agent for the American Welding and Mfg. Co., Warren, O.

» «

**Fred B. Wright,** formerly eastern zone manager, has been made director of public relations of the Western Electric Co., New York City. He succeeds **Philip L. Thomson,** who retires under the company's pension plan after 41 years of service.

MARQUETTE WELDS
WILL LAND THE
BIG ONES
LOWER COSTS
FASTER PRODUCTION
It's always open season for this kind of fishing . . . and the big ones won't get away if you go after them with the smooth, flawless welds of MARQUETTE equipment.
MARQUETTE has a staff of welding experts, from coast to coast. Their job is to furnish you free "guide service." They will bring you the latest developments in welding and its application to all kinds of fast, low cost metal fabrication or repair.
LOW INITIAL COST — LOW COST OPERATION
NEGLIGIBLE UPKEEP — NO "MAGNETIC BLOW"
SIMPLE OPERATION — FAST, FLAWLESS WELDS
ALL ASBESTOS INSULATION
Send for free, 24 page, illustrated booklet
MARQUETTE MFG. CO., INC.
Minneapolis 14, Minn.
MARQUETTE
REGISTERED U.S. PAT. OFFICE
a.c. arc welders

# C-F POSITIONERS



### Faster, Better, Safer Welding

And more economical too, with C-F Positioners. Permit downhand welding of top, bottom and sides with a single setup—more uniformly perfect joints, better fillets and beads. Eliminate frequent crane-lifts, save crane-operator and sling crew time. There's a model for every need—from small, hand-operated types to giants that handle 30,000 lbs. weldments. C-F Positioners revolve a full 360°, tilt to 135° beyond horizontal. Table rotation from 0 R.P.M. up, for automatic welding. They are universal tools, adjustable for height—pedestal or boom mounted to give maximum floor and working clearance.

Write for Bulletin WP-22

**CULLEN-FRIESTEDT CO.**

1309 S. Kilbourn Ave. Chicago 23, Ill.

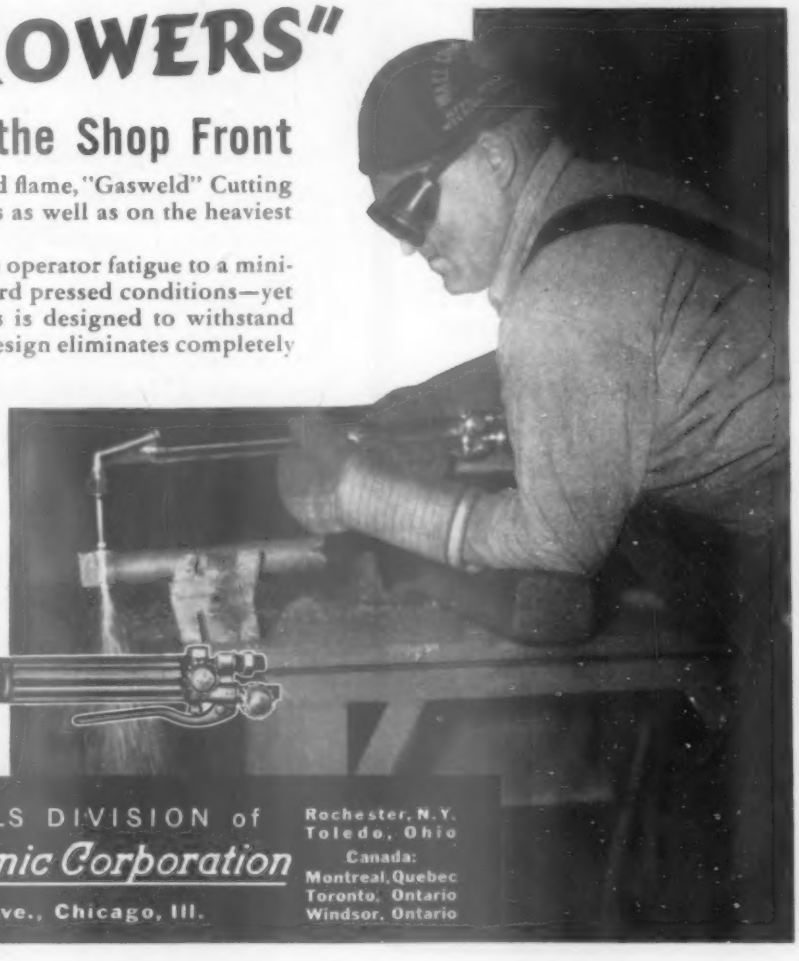
# "FLAME THROWERS"

## Vital Weapons of the Shop Front

Cutting through metals with a superheated flame, "Gasweld" Cutting Torches give finest results on light metals as well as on the heaviest cutting job.

Light weight and perfect balance reduce operator fatigue to a minimum—an important feature for today's hard pressed conditions—yet the rugged construction of these torches is designed to withstand hard daily usage. Exclusive "Free Flow" design eliminates completely the danger of flashback.

For full explanation of special features write for Welding and Cutting Equipment catalog.



Gasweld CUTTING TORCHES

Buffalo, N. Y.
Cincinnati, O.
Chicago, Ill.
Detroit, Mich.
Louisville, Ky.
Milwaukee, Wis.

WALL CHEMICALS DIVISION of
The Liquid Carbonic Corporation
3110 S. Kedzie Ave., Chicago, Ill.

Rochester, N. Y.
Toledo, Ohio
Canada:
Montreal, Quebec
Toronto, Ontario
Windsor, Ontario

Thermacote WELDING Lenses WIN

In a competitive test during a period of one month in a large ship yard Thermacote Plastic Coated Lenses increased welding footage, over the nearest lacquer coated cover glass.

10%

Lacquer Covered Glasses
One month's footage
38,651 feet

THERMACOTE
PLASTIC COATED LENSES
One month's footage
42,085 feet

Same number of welders were used in each case. No changes made in technique or efficiency other than the change from lacquered cover glasses to Thermacote Plastic coated lenses. Other facts regarding these tests, which are of vital interest to every welding engineer, superintendent or other executive, may be obtained by writing for details to the nearest Thermacote dealer.

THERMACOTE CO.
120 ARLINGTON STREET
NEWARK 2, NEW JERSEY

1101 McLAUGHLIN BLVD.
PORTLAND, OREGON

420 SOUTH SAN PEDRO ST.
LOS ANGELES, CALIFORNIA

# Helpful Literature Just Published

*The following reviews are of recent publications of interest to those in the welding industry. Unless otherwise stated, they may be obtained without cost by writing to the manufacturers listed.*

## Preheat Calculator

An ingenious new calculator enables quick determination of the proper preheating and interpass temperatures for the comparatively few steels which require preheating in order to minimize the tendency toward excessive hardening and prevent possible cracking of the base metal adjacent to the weld. The "Welding Preheat and Interpass Temperature Calculator" is a 6¼ in. diameter circular disc with four movable cardboard sections. It provides for varying percentages of copper, vanadium, molybdenum, nickel, chromium, phosphorous, silicon, manganese and carbon and for plate thicknesses ranging from 0.05 to 10 in.

This calculator will not be needed in welding steels of low carbon and alloy content, but it should serve as a convenient guide to best welding results for "difficult" steels having relatively high contents of carbon and/or other alloying elements. It is available from **The Lincoln Electric Co.**, Cleveland, at 25 cents, postpaid anywhere in the United States.

» «

## Machine-Cutting Booklet

"Machine Flame-Cutting for Assembly-Line Fabrication" is an eight page illustrated booklet describing assembly-line fabrication of frames and other components of generators for Diesel-electric units, using multiple-torch machines for beveling, turning and shaping operations that were formerly performed by machine tools. The material is based on a paper presented at the last annual AWS meeting by C. O. Adams, welding engineer, Delco Products division of General Motors. Copies of this booklet (Form ADR-13) may be obtained from **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

» «

## Torch Information

All too frequently the man who wields the welding torch is ignorant of the fundamentals of its construction. To remedy that situation, there has been prepared a comprehensive 36-page, 6 by 9 in. booklet which gives plain practical facts on how welding and cutting torches are made, what can go wrong with them and what should be done to repair them.

This book differs from most manuals of this character in that it is written throughout in the everyday language of the shop man; for example: "Treat your welding equipment with as much respect as you give your automobile. When you're through with it, *hang it up* out of the way. Don't set it down where some cookie can step on it or throw a monkey wrench on it. Even though this equipment may be owned by your employer, treat it as if it were your own." Numerous cartoons and sketches are used to clarify and amplify the various points discussed in the text. **Smith Welding Equipment Corp.**, Minneapolis 14.

» «

## Aluminum Welding Booklet

A 20-page, 3½ by 6 in. booklet, "The Welding of Aluminum," discusses both arc and gas welding procedures. Among subtopics mentioned are the preparation of joint edges, use of reversed polarity, slag removal, type of flame, when to use preheating, recommended fluxes and welding rods, etc. Two useful tables are included: one covering electrode sizes and machine settings for various thicknesses, and the other giving the approximate size of tips and the relative gas pressures used in both the oxy-hydrogen and oxy-acetylene processes. **Welding Alloys Mfg. Co.**, 744 Broad St., Newark 2.

» «

## Resistance-Welding Data

A 28-page letterhead size book, GET-1189, discusses resistance welding from the fourfold aspect of: (1) methods and equipment, (2) factors determining the choice of equipment for best welding results, (3) welding electrodes and their maintenance, (4) cleaning material, operation and maintenance hints, trouble shooting. The material is reprinted from a series of articles by R. T. Gillette, resistance-welding engineer. **General Electric Co.**, Schenectady.

» «

## Tool Steel Welding Book

A 72-page 5½ by 8½ in. book has been brought out by **Welding Equipment and Supply Co.**, 223 Leib St., Detroit 7, for a permanent record of the story told by its two sound-slide films "Let's Get the Low-Down" and "Let's Do It Right." These films trace the development of tool-steel welding electrodes and depict their proper applications in the metal-arc welding of tools and dies.

National

# Carbide

•

EFFICIENT

ECONOMICAL

DEPENDABLE

•

For
Welding and Cutting
*Specify*

**NATIONAL CARBIDE IN THE RED DRUM**

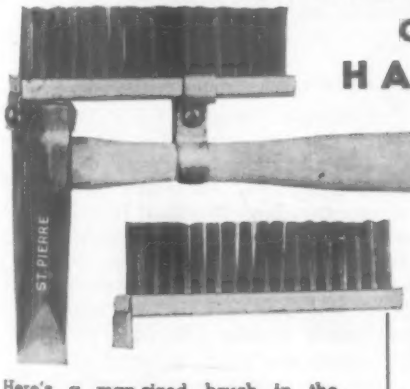
•

**NATIONAL CARBIDE CORPORATION**
60 E. 42nd St., New York 17, N. Y.



# ABUSE MEANS NOTHING TO ST. PIERRE

CHIPPING HAMMERS




**Breaks the Scale Cleans the Surface in One Operation**

Here's a man-sized brush in the right position for easy use after chipping scale from welded surface. Hammer-Chisel made of highest quality tool steel. Entire tool is well-balanced. For economy, for durability use ST. PIERRE Hammers.

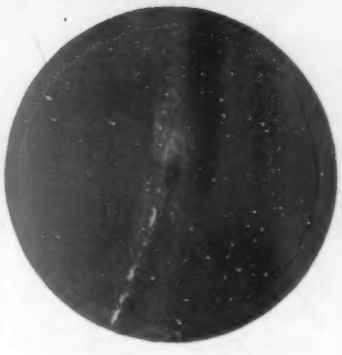
*Order Today From Your Jobber or Direct*

**ST. PIERRE Chain Corporation**
WORCESTER DROP FORGINGS MASSACHUSETTS



# JONES Abrasive Belt SWING GRINDER

GETS IT SMOOTHER FASTER!



- High Speed Cutting
- Smooth, Even Surface
- Uninterrupted Grinding
- Easy to Install and Operate
- Quick Abrasive Belt Change
- Perfect Balance at Any Angle
- Reduces Time and Cost

You speed up your weld grinding three to six times with the Jones Abrasive Belt Swing Grinder.—And you get a smoother, more even surface.

It's easy to grind and finish with the Jones Swing Grinder, using quick-change, fast-cutting, economical abrasive belts. All controls are handy to the operator. This portable grinder is readily mounted for covering large work areas.

Get the details now on easy, smooth, high-speed grinding. Jones also makes Bench Grinders, and equipment for all types of grinding and polishing work.

**WRITE TODAY FOR JONES SWING GRINDER BULLETIN**

**JONES ENGINEERING CO.**
DEPT. C-1
ELLWOOD CITY, PENNA.
*Abrasive Belt Grinding Specialists*

### War Contract Assistance

Much has been written about interpreting war contract termination regulations but very little of a how-to-do-it nature. This new 12-page manual, "How One Company Organized to Handle War Contract Terminations," should be helpful to those who are now starting their termination headaches. The preparation of the manual was suggested after the material had been reviewed by Chicago Ordnance, Army Service Forces at Washington and the National Association of Manufacturers.

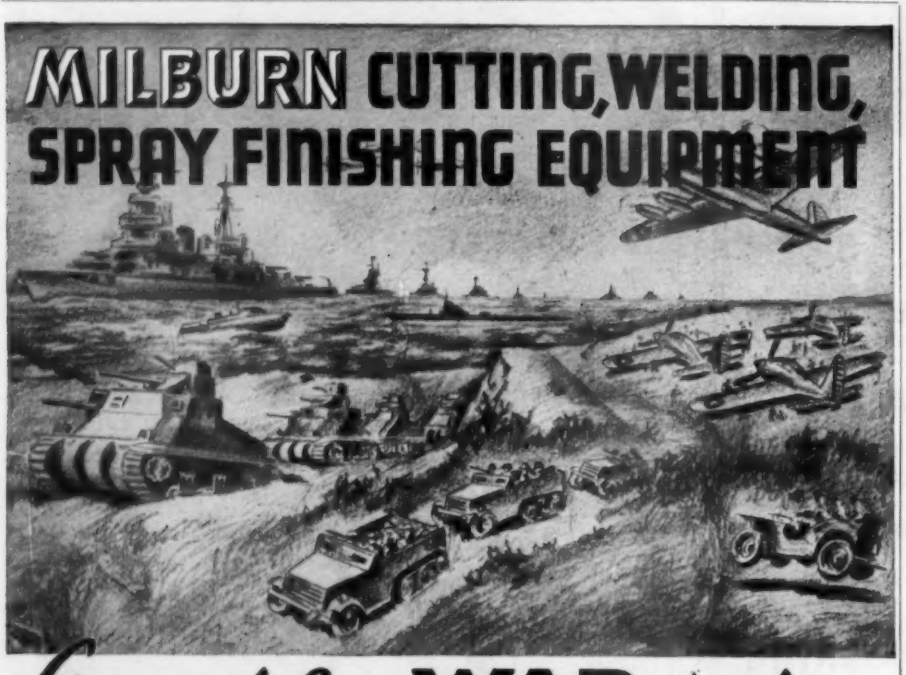
The problem faced by the manufacturer in question was to compile the necessary facts and figures so that claims could be presented and paid in the quickest possible time and to do this without disrupting the flow of regular work in a busy organization. The book illustrates the 14 forms which were developed to expedite the work.

A copy may be obtained without charge from **Lyon Metal Products, Inc.** Aurora, Ill.

» «

### Compressor and Pump Catalog

A new 32-page catalog (Form 1502) of compressors and vacuum pumps in sizes from ½ to 10 hp has been published by **Ingersoll-Rand Co.**, 11 Broadway, New York City 4.


*Geared for* **WAR** *today —or* **PEACE** *tomorrow*

Through two wars and for almost half a century, The Alexander Milburn Company has been serving Government and Industry. Milburn Equipment may be relied upon for superior, dependable service under stress of the most adverse conditions.

Write for Catalog.

The ALEXANDER MILBURN Company

**1403 W. BALTIMORE ST., BALTIMORE, MD.**


### Fire Prevention Folder

How to keep workers' clothes from igniting because of flying sparks is told in a four-page, letterhead size folder from **The Wolfe-Kote Co.**, Sheboygan, Wisc. This folder describes various applications of "Flame-Pruf," a material that is dissolved in water to provide an odorless, non-injurious flame-preventive solution.

» «

### Electrical Symbols Chart

A comprehensive chart of more than 500 American Standard graphical symbols for power, control and measurement is included in Bulletin 4403 published by **the I-T-E Circuit Breaker Co.**, 19th & Hamilton, Philadelphia 30. Measuring 8½ by 11 in. folded, the chart unfolds to 17 by 22 in. for wall mounting or spreading under a glass table top. It is in blueprint style and lacquered to withstand frequent handling.

The symbols used in one-line diagrams and those used in complete wiring diagrams are given side by side for comparative reference. Of the more than 500 symbols and switch sequence tabulations included, over 100 are for motors and other rotating machines.

» «

### A-C Welder Booklet

Natural-color photographs and cartoons of Joe Magee enhance the attractiveness of "Alternating-Current Arc Welders" (GEA-4081), a 32-page, 8 by 10½ in. booklet, published by the **General Electric Co.**, Schenectady, N. Y. This booklet explains why the use of the a-c arc welding process has increased during the past few years and cites a number of experience reports from large users in different industries. It also includes a useful discussion of the "deep-fillet" welding technique, pictures and describes the company's manually operated a-c welders and furnishes specifications on nine G-E electrodes.

» «

### Aluminum Welder Bulletin

Progressive Welder Co.'s technical bulletin No. 103 gives full information on the new rocker-arm spot welder described in THE WELDING ENGINEER last month (page 64, May issue). This machine is designed to make between 500 and 1,000 sound spots per hour on aluminum structural sections ranging up to two ⅛ in. thicknesses of 24-ST. **Progressive Welder Co.**, 3050 E. Outer Drive, Detroit 12.

» «

### Airco Price List

A 20-page revised price list, "Gas and Electric Welding Supplies and Accessories," supersedes all previous Airco price lists. The products listed include gas welding rods, hard-facing alloys, brazing alloys, fluxes, helmets, goggles, gloves, aprons, welding cable, cable lugs and ground clamps. **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

The NEW, IMPROVED Variable-Core type

# GREYHOUND

A. C.
Arc Welders
Provide
LOWER
OPERATING
COSTS
for
HEAVY DUTY
PRODUCTION

Detailed information and prices sent on request

*Distributors Wanted*

GREYHOUND A. C. ARC WELDER CORP.
*Manufacturers*
520-28 Morgan Ave., Brooklyn, N. Y.

## POSITION YOUR WORK

### REDUCE WELDING COSTS

*Model WP-2*
*2500 lbs. Capacity*

* New and improved
* Lower priced
* More versatile
* Hydraulic power tilting
* Positive table locking device
* Telescopic elevation
* Manual turning to suit any welding speed
* Large table area with handy slots
* Portable or column-in-floor mounting
* Hand wheel or power turning available

*Why postpone the savings in time, effort, and money this new positioner will give you? Write today for Bulletin P-2.*

*General Offices:* 4513 West National Avenue, Milwaukee 14, Wis.

HARNISCHFEGER
CORPORATION
ARC WELDERS • EXCAVATORS • ELECTRIC CRANES P&H MOTORS • HOISTS • WELDING ELECTRODES

*Canadian Distribution:* The Canadian-Fairbanks Morse Co., Ltd.

CANADIAN RADIUM IN MODERN INDUSTRY

## ...A THROUGH-AND-THROUGH EXAMINATION WITH CANADIAN RADIUM WILL TELL YOU

Radium's Gamma-rays can penetrate solid steel many inches thick, and provide clear, permanent records of any internal defects.

Plants regularly using Canadian radium to check important metal parts in the earliest production stages, are obtaining valuable data on their foundry technique and insuring the soundness of their products. A radium radiograph often reveals defects which can be corrected—and repairs verified—before entailing added machine, labor and shipping expenses.

IN AMERICA'S LEADING LABORATORIES radium has proven indispensable for conveniently examining steel, bronze, brass and other metal parts ranging from ½ to 10 inches in thickness

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CORPORATION
630 FIFTH AVE., ROCKEFELLER CENTER, NEW YORK 20, N.Y.

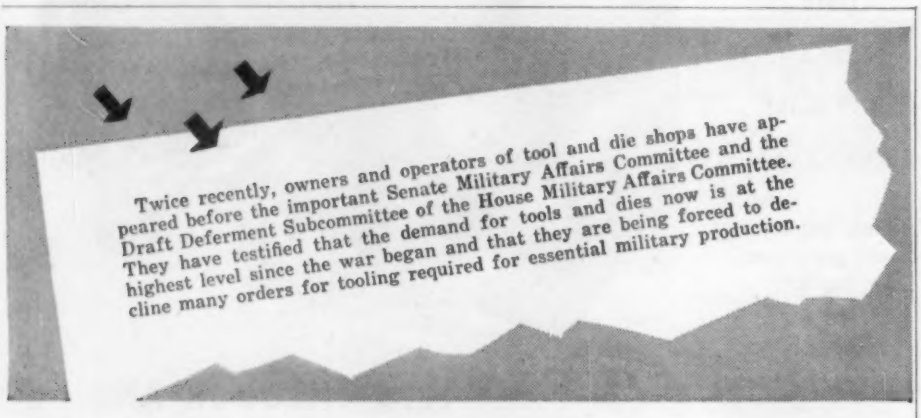
### Airco Railroad Booklet

How American railroads have been able to relieve a critical parts shortage by ingenious adaptations of various welding processes is related in a new 12-page booklet, "Locomotive Parts Fabrication" (Form ADR11) by J. W. Kenefic, superintendent of railroad service, western division of Airco. A study of 350 locomotive parts disclosed that 90% of them could be restored or fabricated by welding and flame-cutting, the author relates. An interesting case is the welding of crown brasses for locomotive driving boxes, which effected an 80% saving of strategic metal. Other locomotive parts successfully rebuilt by welding processes are stoker screws, water pump pistons, crosshead shoes, crate bars, brake heads and hangers. **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

» «

### Herco Catalog

A catalog of Herco arc welders is just off the press. This four-page letterhead-size folder illustrates the various members in the Herco line of "streamlined arc" a-c welders and discusses technical specifications and special features. **Hercules Electric & Mfg. Co., Inc.**, 2416 Atlantic Ave., Brooklyn 33.



Twice recently, owners and operators of tool and die shops have appeared before the important Senate Military Affairs Committee and the Draft Deferment Subcommittee of the House Military Affairs Committee. They have testified that the demand for tools and dies now is at the highest level since the war began and that they are being forced to decline many orders for tooling required for essential military production.

*Get more service out of the Tools and Dies you have . . . . You can do it by Arc Welding with*

**PHILLIPS "CRUCIBLE ARC"** Electrodes for Tool and Die Steels

**WE are helping others, and we can help you—(1) to repair worn or damaged tools and dies, (2) to make new dies at less cost, (3) to accommodate engineering changes and (4) to save money, materials and machining time. Our new manual on welding tool and die steels is complete. It tells: how to select the proper electrode for each job; deposit characteristics of each electrode; physical properties; welding techniques; heat treatment temperatures. You need this vital maintenance data in your shop library.**

**This manual contains invaluable information for your tool conservation program. Send for your copy today.**

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MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES


### Equipment Conservation

A 4-page letterhead-size bulletin titled "Conservation Welding" is packed with useful information on the uses of hard-facing to cut replacement costs. The suggested applications include the repair of tractor sprockets, manganese steel crusher mantles, clamshell bucket teeth, crusher liner segments, manganese steel rock hammers, conveyor screws, pusher shoes, etc. This folder (Bulletin 344-W) is available from the **American Manganese Steel Div. of American Brake Shoe Co.**, Chicago Heights, Ill.

» «

### Gas Welding Catalog

In the year 1894, John Nageldinger received a patent on his first pressure reducing valve. Today his company manufactures a complete line of cylinder valves, needle valve controls, cylinder manifolds, pressure regulating valves and regulators, safety valves and other welding and cutting equipment as well as compressed gas apparatus for oxygen, acetylene, hydrogen and other gases. These various products are illustrated and described in a new 20-page, letterhead-size catalog available from **John Nageldinger & Son, Inc.**, 409 East 91st St., New York City 28.

» «

### Postwar Planning Booklet

To help create a little order out of the many conflicting statements that have been made concerning our nation's postwar economy, the New York **Journal of Commerce** has digested 286 of the more important peacetime plans and projects into a compact 24-page publication. A copy may be obtained by sending 25 cents to the newspaper at 63 Park Row, New York City 15.

» «

### Inspection Folder

A four-page, letterhead-size folder on the microscopic inspection and control of surface finishes has been published by **George Scherr Co., Inc.**, 200 Lafayette St., New York City 12. This describes three models of Spencer binocular microscopes for magnifications up to 100X.

» «

### Ventilator Folder

"Ventilation — Vacillation — Verification" is the title of a letterhead-size folder describing the new "Iron Lung" power roof ventilator for removing fumes, gases, steam, smoke and excessive heat from industrial buildings. **Powermatic Ventilator Co.**, 4019 Prospect Ave., Cleveland 3.

» «

### X-Ray Inspection Folder

A self-contained industrial X-ray unit to permit non-destructive examination for internal flaws, cracks etc., is described in a four-page folder (S150). **North American Philips Co., Inc.**, 100 East 42nd St., New York City 17.

FOR EVERY TYPE OF WELDING
*Choose* THE WELDER
WITH PROVEN PERFORMANCE SINCE 1931

**POSITIVE ARC**
*A. C. Arc Welder*

1 Built in high frequency circuit strikes arc easily with 1 or 100 amperes.

2 Has flexibility of DC welder, plus the advantages of AC arc.

3 Current adjustment in 1 ampere steps from 1 up to maximum range of welder.

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5 Excels in the welding of all light gauges.

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Speer HOLD-ARK Carbon Electrodes give you far longer carbon life (33% longer) because the points are better . . . they have a more acute-burning angle . . . and all of the rod is burned in useful work.

HOLD-ARK Electrodes give a steady, penetrating arc, high in heat value; a quieter, smoother arc that every welder will appreciate. Uniform composition assures a longer, useful-burning life; absence of waste due to spindling gives 13% more weld per inch of rod.

Because HOLD-ARK Electrodes are 22% harder and stronger, they withstand shock and abuse better than the best carbon rods available prior to the introduction of HOLD-ARK.

For better, faster, more economical carbon arc welding or cutting—either by hand or by automatic machines—specify Speer HOLD-ARK Carbon Electrodes.

## FROM THE PATENT OFFICE

### Torch Tip Cooler

2,348,385. **Wilbur S. Houghton,** Glendale, Calif., assigned to **Victor Equipment Co.,** San Francisco. Filed Jan. 3, 1941. Issued May 9, 1944.

A torch tip having a tubular shank from which projects a number of heat-radiating fins; the shank-and-fin portion constitutes a separate section that is detachably connected to the tip at one end and to the torch body at the other

end. The shank and the fins are made principally of aluminum in order to lower the tip temperature.

» «

### Flame-Scarfing Method

2,346,718. **James L. Anderson,** Closter, N. J., assigned to **Air Reduction Co., Inc.,** New York City. Filed Feb. 10, 1942. Issued April 18, 1944.

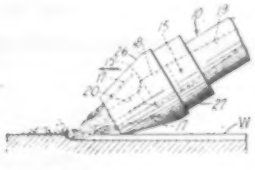
A method of removing material from the surface of a ferrous metal body by directing a plurality of scarfing jets against the work with the metal at ignition temperature. The scarfing jets

are at an acute angle to the surface and are closely spaced so that they will remove the metal from touching areas. Prior to and during the scarfing operation, the work is heated by means of other flames directed at an acute angle somewhat greater than the angle at which the scarfing jets are directed. Substantially all of the preheating flames are located above the streams of scarfing oxygen.

» «

### Flame-Gouging Method

2,347,758. **Wesley S. Walker,** Larchmont, N. Y., and **Wilgot J. Jacobson,** Plainfield, N. J., assigned to **The Linde Air Products Co.,** New York City. Filed Nov. 26, 1937, and May 28, 1940. Issued May 2, 1944.



Method of gouging a shallow layer of surface metal from a ferrous metal body such as a steel billet. At least a portion of the surface of the billet to be gouged is heated to ignition temperature, and a voluminous stream of oxidizing gas is then directed at an acute angle against the preheated surface portion. Stream is discharged through an orifice that is elongated transversely of the direction of flow to provide a substantially sheetlike stream of predetermined velocity, which may be reduced when desired. Stream and the surface being gouged are moved relatively in a direction parallel to the surface and in the general direction of stream flow.

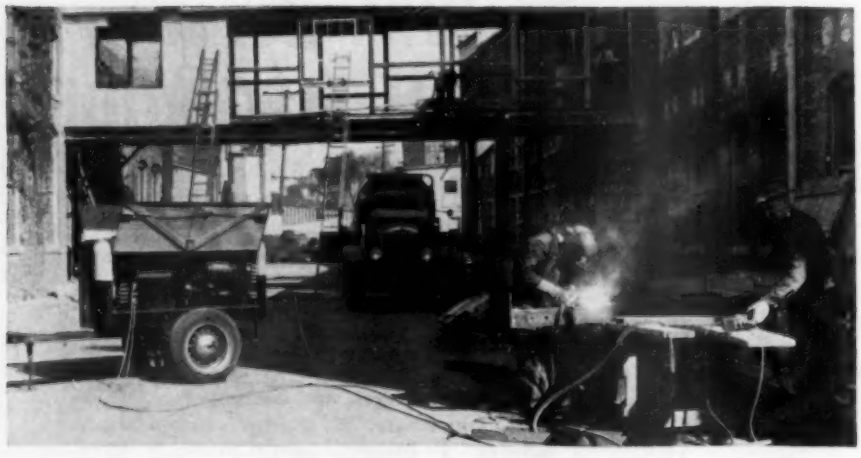
» «

### Chain Welding Apparatus

2,348,087. **Robert S. Miller,** Portland, Ore., assigned to **Pacific Chain and Mfg. Co.,** Portland. Filed Nov. 22, 1941. Issued May 2, 1944.

This chain link welding apparatus has a pair of separable molds, the opposing surfaces of which are each formed with a longitudinally extending groove conforming to the link to be welded. Each of the opposing faces also has a central recess extending from an external face of the mold to the previously mentioned groove.


**When Pierce Governs The Engine – The Welding Arc Stays Constant!**



• All over the nation, in important little jobs and tremendous vital ones, Pierce Governors are giving the close, sensitive regulation that welding machines *must* have. They hold the arc constant—assure *unfailing* recovery of current characteristics within *three-tenths of a second* after striking the arc. To be sure of the weld, be sure the power unit is governed by Pierce. Pierce Governors are built with the "know-how" of the world's largest governor manufacturers—to give you the maximum of split-second control and the longest trouble-free service.

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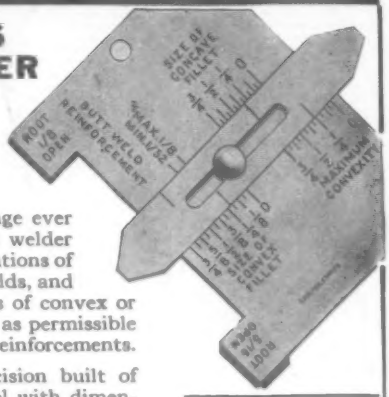
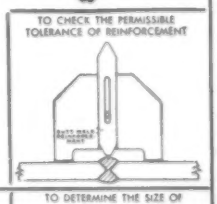
For Accurate
Calibration of
BUTT & FILLET
TYPE WELDS

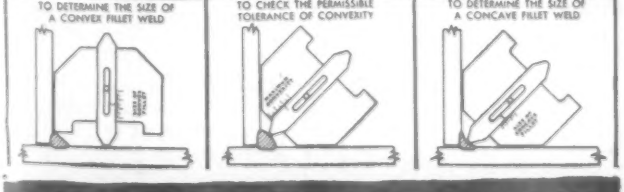


The finest welding gage ever developed. Enables a welder to meet exact specifications of butt and fillet type welds, and accurately check sizes of convex or concave fillets as well as permissible tolerance of butt weld reinforcements.

Instrument is precision built of chromium plated steel with dimensional readings clearly indicated. Made pocket size 2½" x 3" very handy and easy to operate. Eliminates rejections. Saves time and electrodes. Price $3.00.

*Write for details and Welding Symbols Chart No.* **A-6.**





TO DETERMINE THE SIZE OF A CONVEX FILLET WELD
TO CHECK THE PERMISSIBLE TOLERANCE OF CONVERITY
TO DETERMINE THE SIZE OF A CONCAVE FILLET WELD

CHICAGO TOOL AND ENGINEERING CO.
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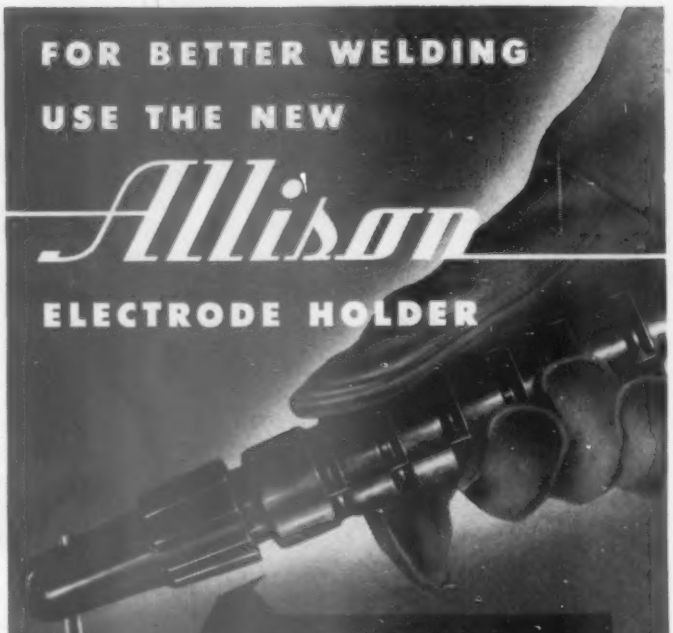
FOR BETTER WELDING
USE THE NEW
Allison
ELECTRODE HOLDER



Simplified design — only three main parts — fully insulated — no exposed metal — slender lightweight, neatly balanced to eliminate operator fatigue . . . reduces maintenance, cuts electrode costs and increases welding production."

Particularly designed for welding in overhead, vertical or flat positions, ALLISON Model "A" Electrode Holders are slender, light, neatly balanced. Easy to use in awkward positions, they're moulded of a high heat resistant plastic. Being fully insulated the welder is protected from burns as there is no exposed metal to cause flashes. There are no springs, no handles, no gadgets to catch or snag when dragged by cable. Insulated plastic tip permits burning electrodes to within ½" of holder — thus cutting electrode costs. See your local distributor or write direct to —

***Made in two sizes for high speed production welding — the Model "A" is built to handle heavier 400-500 amperes, weighs but 19 ounces; the Model "B" is a lighter model for 200 amperes use, weighs 6½ ounces.**

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TOOL AND ENGINEERING CO.
4031 Whittier Blvd.
Los Angeles 23, California

A-K CUP WHEEL for weld grinding, used with portable power unit.

**YOU CAN INCREASE OUTPUT** by using Atlantic's A-K Grinding Wheels. Designed specially for fast, cool cutting of metals, they make possible the maximum work speed without danger of burning. If ordinary wheels are falling down on the job, write for the free service of an Atlantic engineer . . . let him show you how easily you can get the results you want with Atlantic A-K Grinding Wheels. Atlantic Abrasive Corp., 545 Pearl St., South Braintree, Mass.

**Atlantic** PATENTED RESINOID BONDED **GRINDING WHEELS**

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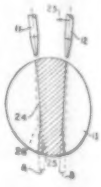
255 9th St.,
San Francisco 3,
Calif.,
Newark 5, N. J.

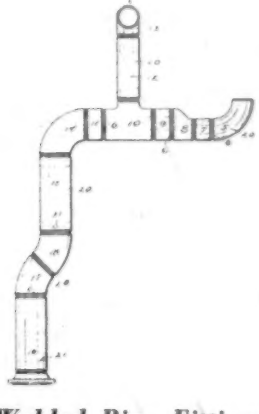
### Flame-Cutting Method

2,347,245. **James L. Anderson,** Closter, N. J., assigned to **Air Reduction Co., Inc.,** New York City. Filed Jan. 25 1940. Issued April 25, 1944.



A method of cutting transversely through bar stock or other pieces of cylindrical shape by directing a substantially vertical oxygen jet from a torch against surface metal that has been heated to ignition temperature. The torch is moved parallel to itself and about the axis of the work-piece on a radius that maintains it at a substantially uniform distance from the surface to be cut. Speed of movement along the arc is regulated at a rate that reduces the horizontal component of the torch movement in order to compensate for changes in the thickness of the piece as the jet cuts nearer to the center where the piece is of maximum diameter. Simultaneous cutting from the opposite side of the work-piece, along the same right plane, is done by an oxygen jet directed from a second torch. The angle between the second torch and the vertical jet from the first torch is approximately equal to the sum of the drag angles of both cuts near the inner ends of cuts. The second oxygen jet is stopped and its direction of movement reversed before the torches can come together. The first torch, however, continues the cutting operation until its cut intersects that of the second torch and completely severs the work-piece.

» «



### *Welded Pipe Fittings*

2,344,424. **Howard S. Singleton,** Alexandria, Va. Filed Feb. 17, 1943. Issued March 14, 1944.

This patent pertains to a plurality of pipe fittings welded to make up a threadless pipe unit in which some fittings will lie at angles to adjoining ones. Each fitting has indicating marks spaced in degrees to coact with the marks of adjoining fittings in order to indicate the degree of angular offset in the line of any angularly disposed fitting. On straight nipples or pipe sections, the indicating marks extend from end to end so that the angular offset may be determined regardless of the point at which the section or fitting is cut off.

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SKIN PROTECTION AGAINST

WELDING FLASHES

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This special-formula FEND Protective Cream, when rubbed on the skin, provides an invisible barrier against irritation from welding flashes—screening out harmful ultra-violet and infra-red light rays, affording welcome skin protection for welders. FEND-L is quickly applied, easily removed at end of work with mild soap and warm water. Write for descriptive literature!

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**AUTOMATICALLY and keeps it going!**

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The improved flux for silver solder brazing meets Government Specifications. Permits free flowing, effects strong bonds and is free from imperfections. No lumps, does not harden in storage. Excess easily removed with hot water.

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Large orders on yearly contracts at special prices. Free ½ lb. sample prepaid. No obligation, if requested on company letterhead. Try it, compare it, and you will use it.

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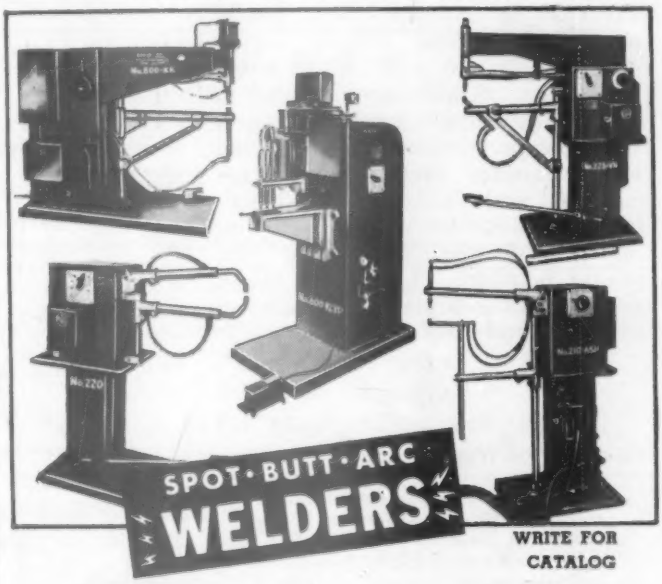


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WE INVITE CONTRACT SPOT WELDING IN LARGE OR SMALL QUANTITIES.

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For work in confined spaces, humid atmospheres, these Willson heavy-duty composition cups are the scientific answer. RR51's are designed to permit unusual air circulation within the eye cups. Notice the wide-slotted lens retaining rings. RR51's are equipped with Willson Super-Tough lenses, famous for clear vision and impact-protection. RR51's are only one of hundreds of styles of safety goggles in the complete Willson line of eye, head and lung protection.

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Every Willson Super-Tough lens—*every one*, not just a sampling few—is *tested* in the Polariscope, to determine uniformity of heat treatment and degree of toughness. Photo shows the pattern cast by a lens that has perfect strain distribution. If a lens shows the slightest deviation from this pattern, out it goes.

*There's a Willson Safety Service Distributor in every major industrial area.*

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

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PRODUCTS INCORPORATED

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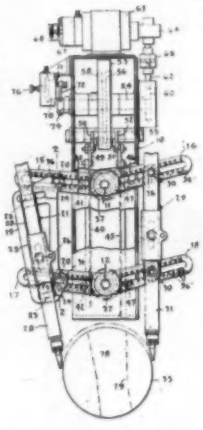
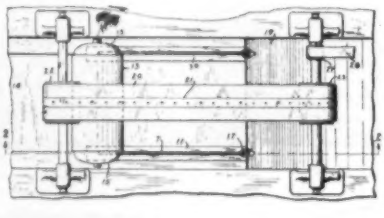
## Flame-Cutting Machine



2,347,804. **James L. Anderson,** Closter, N. J., assigned to **Air Reduction Co., Inc.,** New York City. Filed Jan. 25, 1940. Issued May 2, 1944.

An oxygen-cutting machine for cutting round stock. A supporting frame is located above the work-piece to be cut and holds two torchholders which are independently movable. The holders are shifted along arcuate paths corresponding to the surface of the work to be cut and move the torches across the work from opposite sides. A mechanism operated by an electric motor moves one torch across the work for a given distance and then back to its starting position. The movement of the other torch is started shortly before the first torch.

» «

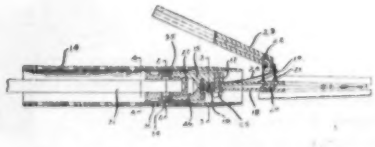


## Tank Welding Method

2,347,914. **George E. Kricker,** Lakewood, O., assigned to **The Midland Steel Products Co.** Cleveland. Filed Sept. 12, 1941. Issued May 2, 1944.

A welding method in which a straight self-operating coated electrode is laid upon a downwardly inclined support and supports a cylinder to be welded. Cylinder rolls by gravity lengthwise on the electrode while arcing with the latter to produce a continuous circumferential weld.

» «



## Electrode Holder

2,348,270. **Frank G. Van Dyke,** Detroit, assigned to **Bordon Mfg. Co., Inc.,** Detroit. Filed July 6, 1942. Issued May 9, 1944.

Elements of this electrode holder are a tubular handle of insulating material, a metallic liner in the handle, a metallic cable connector inserted in the liner and a means for binding the connector in clamping engagement with the liner. The latter means, though contained within the handle, is accessible from outside.


A *new* "Proved-Performer"

**HAMPTON JUNIOR AC WELDER**

The new approved "Hampton Junior" offers a welding range from 20 to 200 amps. . . . operates on either 110 or 220 volts . . . welds 1/16" to 1/8" electrodes . . . infinite number of welding heats and a spatterless arc. Low initial and maintenance cost.

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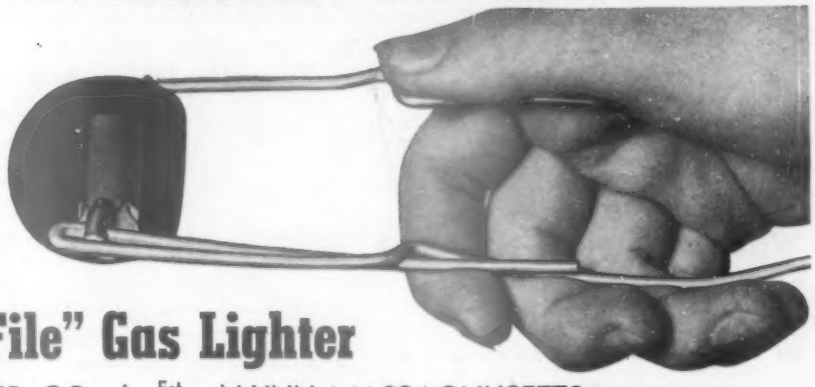
The patented cartridge holding the spark metal locks exactly in correct position, permitting instant replacement. Get acquainted with the many other superior, exclusive features of Improved "Round File."



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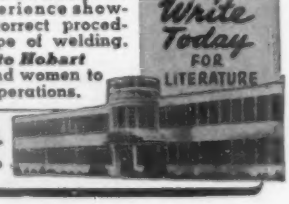

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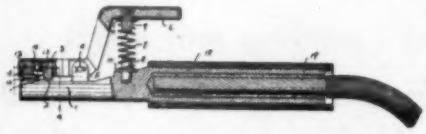
## Electrode Holder

2,347,880. **Baylis F. Budd,** Houston, Tex. Filed March 4, 1943. Issued May 2, 1944.



An electrode holder with two pivotally connected jaws. A plane gripping surface on one jaw faces a circular socket on the other jaw. A disc fitted snugly in the socket has an outer side projecting beyond the corresponding jaw and is provided with a transverse groove to receive an electrode. A yieldable means normally holds the disc in position to clamp an electrode between it and the plane face.

» «

## Flame-Hardening Apparatus

2,346,923. **Alfred Kullman** and **Thomas A. Waltz,** Cincinnati, assigned to **The American Tool Works Co.,** Cincinnati. Filed May 15, 1941. Issued April 18, 1944.

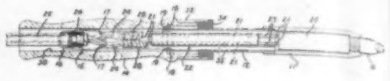
Apparatus for flame-hardening the teeth of racks and the like. The bed has a table for supporting a rack, and a carriage moves longitudinally of the table. A torch is supported by the carriage and is movable upon it transversely of the table; this torch is arranged to provide a flame capable of heating the metal teeth of the racks on the table to hardening temperature as the torch is moved transversely. Torch is extinguished by means of a valve located on the carriage and relighted by means of a pilot light. A dog operates in conjunction with the torch-supporting means to close the carriage valve when the torch has been driven across the table.

» «

## *Electric Soldering Iron*

2,346,327. **Conrad L. Pfeiffer,** Chicago, assigned to **Western Electric Co. Inc.,** New York City. Filed Feb. 11, 1942. Issued April 11, 1944.

In this soldering iron, a tubular shank is removably attached to a tubular handle into which extends a multi-conductor cord. The cord is anchored to the end



portion of the shank by means of a V-shaped wire clip having a loop at its apex for receiving the cord and a loop in each leg for receiving the separate conductors. The legs of the clip have bent portions on the ends for engaging portions of the shank in order to hold the clip in the handle.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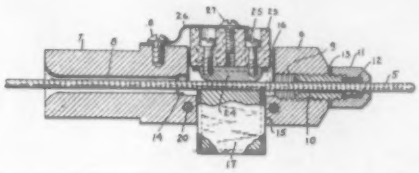
### Automatic Welding Head

2,347,646. **William E. Smith**, Detroit, assigned to **The Midland Steel Products Co.**, Cleveland. Filed March 21, 1942. Issued May 2, 1944.

An arc-welding head having a passage



to slidably receive an electrode and a lateral opening into which a conductor is inserted in any of a plurality of positions. Different portions of the conductor become engaged with the electrode as other portions of the conductor become worn. Thus, there is always contact.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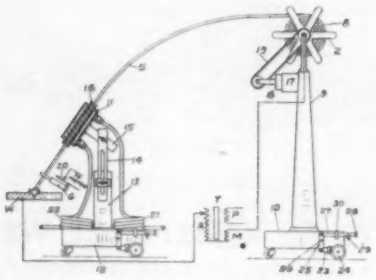
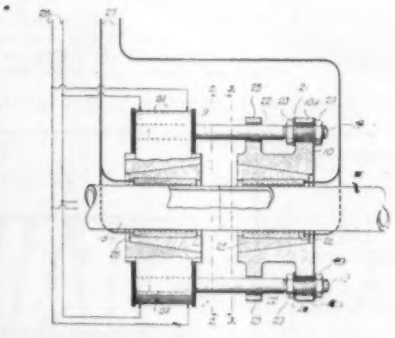


### *Semiautomatic Arc Welding*

2,344,775. **Claude J. Holslag,** South Orange, N. J., assigned to **Electric Arc, Inc.** Filed May 30 1942. Issued March 21, 1944.

A reel carrying welding wire is mounted upon a portable stand. One terminal of the current source is connected to the wire on the reel and the other to the work. The wire is guided in a curvilinear path by means including a second portable stand and a combined sleeve and cooling chamber. The latter is held by the stand at an adjustable angle to insure the curvilinear path of movement. The second stand also carries a means for passing cooling fluid to and from the cooling chamber and a means for feeding the wire from the reel.

» «



### *Pipe Butt Welder*

2,344,939. **Edwin O. Bennett,** Ponca City, Okla., assigned to **Continental Oil Co.,** Ponca City. Filed Dec. 9, 1942. Issued March 28, 1944.

Butt-welding apparatus for pipe sections. The separate work pieces are clamped to frame sections, one of which carries a plurality of solenoids while the other carries plungers extending into the solenoids. Electrical connections for delivering current to the work and for passing current through the solenoids are also included.

» «

### *Spot Welder Control*

2,344,353. **Gerhard Hagedorn,** Berlin-Halensee, Germany, vested in the **Alien Property Custodian.** Filed June 22, 1938. Issued March 14, 1944.

An electronic control system for a resistance-welding process in which the welding electrodes are supplied with alternating current through a reactance coil that is adapted to be influenced by direct current. The condenser discharges through an auxiliary tube in synchronism with the frequency of the a-c source.

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